
# 2006 FRM Practice Exams

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# 2006 FRM Practice Exams

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## Introduction

The FRM exam is a practice-oriented examination. Its questions are derived from a combination of theory, as set forth in the core readings, and eal-world? work experience. Candidates are expected to understand risk management concepts and approaches and how they would apply to a risk manager day-to-day activities.

The FRM examination is also a comprehensive examination, testing a risk professional on a number of risk management concepts and approaches. It is very rare that a risk manager will be faced with an issue that can immediately be slotted into one category. In the real world, a risk manager must be able to identify any number of risk-related issues and be able to deal with them effectively.

The 2006 FRM Practice Exams I and II have been developed to aid candidates in their preparation for the FRM Examination in November 2006. These practice exams are based on a sample of questions from the 2003 FRM Examination and are representative of the questions that will be in the 2006 FRM Examination. Wherever necessary and possible, questions, answers and references have been updated to better reflect the topics and core readings listed in the 2006 FRM Examination Study Guide.

The FRM Practice Exam I and II each contain 50 multiple-choice questions. Note that the 2006 FRM Examination will consist of a morning and afternoon session, each containing **70** multiple-choice questions. The practice exams were designed to be shorter to allow candidates to calibrate their preparedness without being overwhelming.

The FRM Practice Exams I and II do not necessarily cover all topics to be tested in the 2006 FRM Examination. For a complete list of topics and core readings, candidates should refer to the 2006 FRM Examination Study Guide. Core readings were selected by the FRM Committee to assist candidates in their review of the subjects covered by the exam. Questions for the FRM examination are derived from the ore? readings. It is strongly suggested that candidates review these readings in depth prior to sitting for the exam.

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**Suggested Use of Practice Exams**

To maximize the effectiveness of the practice exams, candidates are encouraged to follow these recommendations:

- Plan a date and time to take each practice exam. Set dates appropriately to give sufficient study/review time between each practice exam and prior to the actual exam.
- Simulate the test environment as closely as possible.
  - Take each practice exam in a quiet place.
  - Have only the practice exam, candidate answer sheet, calculator, and writing instruments (pencils, erasers) available.
  - Minimize possible distractions from other people, cell phones and study material.
  - Allocate 100 minutes for each practice exam and set an alarm to alert you when 100 minutes have passed. Complete each exam but note the questions answered after the 100 minute mark.
  - Follow the FRM calculator policy. You may only use a Texas Instruments BA II Plus (including the BA II Plus Professional) calculator or a Hewlett Packard 12C (including the HP 12C Platinum) calculator.
- After completing each practice exam,
  - Calculate your score by comparing your answer sheet with the practice exam answer key. Only include questions completed in the first 100 minutes.
  - Use the practice exam Answers & Explanations to better understand correct and incorrect answers and to identify topics that require additional review. Consult referenced core readings to prepare for exam.
  - Pass/fail status for the actual exam is based on the distribution of scores from all candidates, so use your scores only to gauge your own progress and preparedness.

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# 2006 FRM Practice Exam I

## Candidate Answer Sheet

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | (a.) | (b.) | (c.) | (d.) | 26. | (a.) | (b.) | (c.) | (d.) |
| 2. | (a.) | (b.) | (c.) | (d.) | 27. | (a.) | (b.) | (c.) | (d.) |
| 3. | (a.) | (b.) | (c.) | (d.) | 28. | (a.) | (b.) | (c.) | (d.) |
| 4. | (a.) | (b.) | (c.) | (d.) | 29. | (a.) | (b.) | (c.) | (d.) |
| 5. | (a.) | (b.) | (c.) | (d.) | 30. | (a.) | (b.) | (c.) | (d.) |
| 6. | (a.) | (b.) | (c.) | (d.) | 31. | (a.) | (b.) | (c.) | (d.) |
| 7. | (a.) | (b.) | (c.) | (d.) | 32. | (a.) | (b.) | (c.) | (d.) |
| 8. | (a.) | (b.) | (c.) | (d.) | 33. | (a.) | (b.) | (c.) | (d.) |
| 9. | (a.) | (b.) | (c.) | (d.) | 34. | (a.) | (b.) | (c.) | (d.) |
| 10. | (a.) | (b.) | (c.) | (d.) | 35. | (a.) | (b.) | (c.) | (d.) |
| 11. | (a.) | (b.) | (c.) | (d.) | 36. | (a.) | (b.) | (c.) | (d.) |
| 12. | (a.) | (b.) | (c.) | (d.) | 37. | (a.) | (b.) | (c.) | (d.) |
| 13. | (a.) | (b.) | (c.) | (d.) | 38. | (a.) | (b.) | (c.) | (d.) |
| 14. | (a.) | (b.) | (c.) | (d.) | 39. | (a.) | (b.) | (c.) | (d.) |
| 15. | (a.) | (b.) | (c.) | (d.) | 40. | (a.) | (b.) | (c.) | (d.) |
| 16. | (a.) | (b.) | (c.) | (d.) | 41. | (a.) | (b.) | (c.) | (d.) |
| 17. | (a.) | (b.) | (c.) | (d.) | 42. | (a.) | (b.) | (c.) | (d.) |
| 18. | (a.) | (b.) | (c.) | (d.) | 43. | (a.) | (b.) | (c.) | (d.) |
| 19. | (a.) | (b.) | (c.) | (d.) | 44. | (a.) | (b.) | (c.) | (d.) |
| 20. | (a.) | (b.) | (c.) | (d.) | 45. | (a.) | (b.) | (c.) | (d.) |
| 21. | (a.) | (b.) | (c.) | (d.) | 46. | (a.) | (b.) | (c.) | (d.) |
| 22. | (a.) | (b.) | (c.) | (d.) | 47. | (a.) | (b.) | (c.) | (d.) |
| 23. | (a.) | (b.) | (c.) | (d.) | 48. | (a.) | (b.) | (c.) | (d.) |
| 24. | (a.) | (b.) | (c.) | (d.) | 49. | (a.) | (b.) | (c.) | (d.) |
| 25. | (a.) | (b.) | (c.) | (d.) | 50. | (a.) | (b.) | (c.) | (d.) |

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# 2006 FRM Practice Exam I
## Questions

1. A two-year zero-coupon bond issued by corporate XYZ is currently rated A. One year from now XYZ is expected to remain at A with 85% probability, upgraded to AA with 5% probability, and downgraded to BBB with 10% probability. The risk free rate is flat at 4%. The credit spreads are flat at 40, 80, and 150 basis points for AA, A, and BBB rated issuers, respectively. All rates are compounded annually. Estimate the expected value of the zero-coupon bond one year from now (for USD 100 face amount).

a. USD 92.59
b. USD 95.33
c. USD 95.37
d. USD 95.42

2. Given the following:

- Current spot CHF/USD rate: 1.3680 (1.3680CHF = 1USD)
- 3-month USD interest rates: 1.05%
- 3-month Swiss interest rates: 0.35%
- Assume continuous compounding

A currency trader notices that the 3-month forward price is USD 0.7350. In order to arbitrage, the trader should:

a. Borrow CHF, buy USD spot, go long Swiss franc forward
b. Borrow CHF, sell Swiss franc spot, go short Swiss franc forward
c. Borrow USD, buy Swiss francs spot, go short Swiss franc forward
d. Borrow USD, sell USD spot, go long Swiss franc forwards

3. Capital is used to protect the bank from which of the following risks:

a. Risks with an extreme catastrophic financial impact
b. High frequency low loss events
c. Low frequency risks with significant severe financial impact
d. High frequency uncorrelated events

4. Which of the following is **NOT** an assumption of the Black-Scholes options pricing model?

a. The price of the underlying moves in a continuous fashion
b. The interest rate changes randomly over time
c. The instantaneous variance of the return of the underlying is constant
d. Markets are perfect, i.e. short sales are allowed, there are no transaction costs or taxes, and markets operate continuously

**5.** Given the following 30 ordered simulated *percentage* returns of an asset, calculate the VaR and expected shortfall *(both expressed in terms of returns)* at a 90% confidence level.

-16, -14, -10, -7, -7, -5, -4, -4, -4, -3, -1, -1, 0, 0, 0, 1, 2, 2, 4, 6, 7, 8, 9, 11, 12, 12, 14, 18, 21, 23

a. VaR (90%) = 10, Expected shortfall = 14
b. VaR (90%) = 10, Expected shortfall = 15
c. VaR (90%) = 14, Expected shortfall = 15
d. VaR (90%) = 18, Expected shortfall = 22

**6.** You have a portfolio with a large investment in the Carpathia EUR 6% 07 bond. This bond rarely trades. Indicative bid prices for small size trades are posted for the bond, but they are mostly from dealers wanting to express a willingness to make negotiated trades. However, the Carpathia USD 9 3/8% 11 bond is liquid. Its dollar return is uncorrelated with the EUR/USD rate. Which of the following statements is correct?

a. The one-day USD VaR computed using the dollar return of the Carpathia USD 9 3/8% 11 bond is an unbiased estimate of the risk of the Carpathia EUR 6% 07 in dollars
b. The one-day VaR for the Carpathia EUR 6% 07 bond using daily indicative bid prices for the bond is an upward-biased estimate of the risk of the bond because the bid-ask spread on an illiquid bond is large
c. It is more appropriate to estimate the VaR of the Carpathia EUR bond using a mix of bonds to account for errors in the bond prices than just using the EUR bond
d. Unless a EUR futures position and a long position in the Carpathia USD bond replicate the Carpathia EUR bond, the VaR for the EUR bond should be computed over a multiple day horizon to account for illiquidity

**7.** A standard synthetic CDO (basket credit default swap) references a portfolio of ten (10) individual corporate names. Assume the following:

- The total reference notional (basket notional) is X, and the term is Y years
- The reference notional per individual reference credit name is X/10 (i.e. equal weight per name)
- The default correlations between the individual reference credit names are all equal to one (1.0)
- The single-name credit default swap (CDS) spread for each individual reference credit name is 100 basis points, for a term of Y years
- The assumed recovery rate on default for all individual reference credits is zero in all cases
- The synthetic CDO comprises two tranches, a 50% junior tranche priced at a spread J, and a 50% senior tranche priced at spread S

All else held constant, if the default correlations between the individual reference credit names are reduced from 1.0 to 0.7, what is the effect on the relationship between the junior tranche spread J and the senior tranche spread S?

a. The relationship remains the same
b. S increases relative to J
c. J increases relative to S
d. The effect cannot be determined given the data supplied

8. Testing the fitness of the operational loss severity and frequency distributions to the data is fundamental. Which of the following is **NOT** a goodness-of-fitness test for severity distributions?

a. Kolmogorov-Smirnov
b. Anderson-Darling
c. Macaulay
d. Cramer-Von Mises

9. An important step in structuring a securitization is determining an adequate level of credit support or enhancement. Which of the following is **NOT** one of common credit enhancement forms for securitization transactions?

a. Subordinated tranches of securitization debt
b. Excess Spread account
c. Cash reserve account
d. Sinking fund account

10. John is an internal auditor covering risk management for a global insurance group in Asia. The company offers and manages investment-linked products ("ILP") for retail clients. ILP is an insurance that allows policyholders to participate in the return of the underlying investment portfolio. Which of the following assessments made during John's audit is indicative of a serious problem?

a. Local subsidiary of the group offers 5% of the portfolio return to the ILP investment manager as an incentive. There is no regulation or group policy that restricts such arrangement.
b. The portfolio accounting and valuation are calculated accurately by the investment manager.
c. Investment manager provides regular investment report to policyholders and its management.
d. The investment manager employs third-party analytic software to assist its daily portfolio management.

11. Based on a 90% confidence level, how many exceptions in back testing a VaR would be expected over a 250-day trading year?

a. 10
b. 15
c. 25
d. 50

12. The result of the linear regression is: Y = 0.10 - 0.50 X with a correlation coefficient R = (-0.90). The fraction of the variance of Y attributable to X is equal to:

a. (-0.90)
b. (+0.90)
c. (+0.81)
d. (-0.50)

13. Suppose the face value of a three-year option-free bond is USD 1,000 and the annual coupon is 10%. The current yield to maturity is 5%. What is the Modified Duration of this bond?

a. 2.62
b. 2.85
c. 3.00
d. 2.75

14. A bronze producer will sell 1,000 mt (metric tons) of bronze in three months at the prevailing market price at that time. The standard deviation of the price of bronze over a 3-month period is 2.6%. The company decides to use 3-month futures on copper to hedge the exposure. The copper futures contract is for 25 mt of copper. The standard deviation of the futures price is 3.2%. The correlation between 3-month changes in the futures price and the price of bronze is 0.77. To hedge its price exposure, how many futures contracts should the company buy/sell?

a. Sell 38 futures
b. Buy 25 futures
c. Buy 63 futures
d. Sell 25 futures

15. Which of the following statements regarding liquidity risk is **CORRECT**?

a. Asset liquidity risk arises when a financial institution cannot meet payment obligations
b. Flight to quality is usually reflected in a decrease in the yield spread between corporate and government issues
c. Yield spread between on-the-run and off-the-run securities mainly captures the liquidity premium, and not the market and credit risk premium
d. Funding liquidity risk can be managed by setting limits on certain markets or products and by means of diversification

16. Which of the following fixed-income securities most likely has negative effective duration?

a. A range accrual note
b. A floating rate note
c. An interest-only tranche of a CMO
d. A principal-only tranche of a CMO

17. An investor holds a portfolio of USD 100 million. This portfolio consists of A-rated bonds (USD 40 million) and BBB-rated bonds (USD 60 million). Assume that the one-year probabilities of default for A-rated and BBB-rated bonds are 3 and 5 percent, respectively, and that they are independent. If the recovery value for A-rated bonds in the event of default is 70 percent and the recovery value for BBB-rated bonds is 45 percent, what is the one-year expected credit loss from this portfolio?

a. USD 1,672,000
b. USD 1,842,000
c. USD 2,010,000
d. USD 2,218,000

18. Which of the following statements is the most accurate about the relationship between a normal distribution and a Student's t-distribution that have the same mean and standard deviation?

a. They have the same skewness and the same kurtosis.
b. The Student's t-distribution has larger skewness and larger kurtosis.
c. The kurtosis of a Student's t -distribution converges to that of the normal distribution as the number of degrees of freedom increases.
d. The normal distribution is a good approximation for the Student's t-distribution when the number of degrees of freedom is small.

19. The VAR on a portfolio using a 1-day horizon is USD 100 million. The VAR using a 10-day horizon is:

a. USD 316 million if returns are not independently and identically distributed
b. USD 316 million if returns are independently and identically distributed
c. USD 100 million since VAR does not depend on any day horizon
d. USD 31.6 million irrespective of any other factors

20. The zero coupon bond of an A-rated company maturing in five years is trading at a spread of 1% over the zero-coupon bond of a AAA-rated company maturing at the same time. The spread can be explained by:

I. Credit Risk
II. Liquidity Risk
III. Tax differential

a. I only
b. I and II only
c. I and III only
d. I, II, and III

**21.** Which one of the following statements about the normal distribution is NOT accurate?

a. Kurtosis equals 3.
b. Skewness equals 1.
c. The entire distribution can be characterized by two moments, mean and variance.
d. The normal density function has the following expression:

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{1}{2\sigma^2}(x-\mu)^2\right]$$

**22.** With all other things being equal, a risk monitoring system that assumes constant volatility for equity returns will understate the implied volatility for which of the following positions by the largest amount:

a. Short position in an at-the-money call
b. Long position in an at-the-money call
c. Short position in a deep in-the-money call
d. Long position in a deep in-the-money call

**23.** A portfolio is composed of two securities and has the following characteristics:

- Investment in security A = USD 1,500,000
- Investment in security B = USD 3,000,000
- Volatility of security A = 7%
- Volatility of security B = 3%
- Correlation between security A and B = 10%

What is the closest answer for the portfolio diversified VAR at 95% confident level?

a. USD 7,351
b. USD 212,920
c. USD 365,715
d. USD 234,630

24. Bank A, which is AAA rated, trades a 10-year interest rate swap (semi-annual payments) with Bank B, which is rated A-. Because of Bank B's poor credit rating, Bank A is concerned about the 10-year exposure it is going to run because of the swap deal. Which of the following measures help mitigate Bank A's credit exposure to Bank B?

I. Negotiate a CSA with Bank B and efficiently manage the collateral management system
II. Execute the swap deal as a reset swap wherein the swap will be marked to market every six months
III. Execute the swap deal with a break clause in the fifth year
IV. Decrease the frequency of coupon payments from semi-annual to annual

a. I only
b. IV only
c. I, II, III and IV
d. I, II and III

25. Which of the following credit risk models in Basel II attempts to recognize diversification effects through a granularity adjustment?

a. Standardized approach based on external credit ratings provided by external credit assessment institutions
b. Standardized approach based on internal portfolio credit risk model
c. Internal Rating Based approach using internal estimate of creditworthiness, subject to regulatory standards
d. All of the above

26. Which of the following loans has the lowest credit risk?

| Loan | 1 Year Probability of Default | Loss Give Default | Remaining Term in Months |
|---|---|---|---|
| a. | 1.99% | 60% | 3 |
| b. | 0.90% | 70% | 9 |
| c. | 1.00% | 75% | 6 |
| d. | 0.75% | 50% | 12 |

**27.** A portfolio management firm manages the fixed-rate corporate bond portfolio owned by a defined-benefit pension fund. The duration of the bond portfolio is 5 years; the duration of the pension fund's liabilities is 7 years. Assume that the fund sponsor strongly believes that rates will decline over the next six months and is concerned about the duration mismatch between portfolio assets and pension liabilities. Which of the following strategies would be the best way to eliminate the duration mismatch?

a. Enter into a swap transaction in which the firm pays fixed and receives floating.
b. Enter into a swap transaction in which the firm receives fixed and pays floating.
c. Purchase an interest rate cap expiring in six months.
d. Sell Eurodollar futures contracts.

**28.** According to the Basel Committee which of the options below is **NOT** a qualitative standard that a bank must meet before it is permitted to use the Advanced Measurement Approach (AMA) for operational risk capital:

a. Internal and/or external regulators must perform regular reviews of the operational risk management processes and measurement systems. This review must include both the activities of the business units and of the independent operational risk function
b. There must be regular reporting of operational risk exposures and loss experiences to business unit management, senior management and to the board of directors
c. The bank's internal operational risk measurement system should not be integrated into the day-to-day risk management processes of the bank but should provide a general overview of the operational risks involved in the processes and operations
d. The bank must have an independent operational risk management function that is responsible for the design and implementation of the bank's operational risk framework.

**29.** If a random variable $X$ has density $f(x)$ and random variable $Y$ has density $g(y)$, then $X$ and $Y$ are independent of each other if and only if their joint density function $h(x,y)$ satisfies,

a. $h(x,y) = k\, f(x)\, g(y)\ ;\ k \neq 1$
b. $h(x,y) > f(x)\, g(y)$
c. $h(x,y) = f(x)\, g(y)$
d. $h(x,y) < f(x)\, g(y)$

30. According to the Basel Committee which of the options below is **NOT** a quantitative standard that a bank must meet before it is permitted to use the Advanced Measurement Approach (AMA) for operational risk capital:

a. A bank's risk measurement system should be sufficiently 'granular' to capture the major drivers of operational risk affecting the shape of the tail of the loss estimates
b. Supervisors will require the bank to calculate its regulatory capital as the Unexpected Loss (UL), disregarding the Expected Losses (EL)
c. Internally generated operational risk measures used for regulatory capital purposes must be based on a minimum 5-year observation period of loss data. When the bank first moves to the AMA a 3-year historical data window is acceptable.
d. The tracking of internal loss data

31. At the end of 2002, the annual marginal default rate was 2.3% for BBB-rated bonds. What is the survival rate for such bonds?

a. 2.3%
b. 7.7%
c. 97.7%
d. Insufficient information provided for the estimation

32. A portfolio manager has a $50 million investment in a high-tech stock with a volatility of 50% and a CAPM beta of 1. The volatility of 50% and the CAPM beta are estimated using daily returns over the past 252 days. A firm's capital allocation allocates capital based on a 1% VaR with a one-year horizon. The capital allocation is USD 66 2/3 million and exceeds the initial market value of the stock. Which of the following statements about the firm's capital allocation scheme is correct?

a. Since a stock has limited liability, the capital allocation cannot exceed $50 million. The firm's mistake is simply to ignore the expected return on the stock
b. The firm made no mistake. The stock is simply very risky
c. The firm makes the mistake of assuming the normal distribution for a high tech stock. The firm should adjust the volatility to take into account the possibility of jumps and 2.33 times the adjusted volatility would produce the right capital allocation
d. The firm should use the lognormal distribution for the stock price over a period of one year since the normal distribution for returns leads to a poor approximation of the distribution of the stock price a year hence

33. Find the operational VaR at a 95% confidence level given the following data.

| Frequency Distribution | |
|---|---|
| Probability | Number |
| 0.8 | 0 |
| 0.2 | 1 |

| Severity Distribution | |
|---|---|
| Probability | Loss |
| 0.75 | USD 20,000 |
| 0.24 | USD 100,000 |
| 0.01 | USD 600,000 |

a. USD 9,000
b. USD 45,000
c. USD 91,000
d. USD 100,000

34. Which of the following options is strongly path-dependent?

a. An Asian option
b. A binary option
c. An American option
d. A European call option

35. Which of the following arguments is **NOT** true? Key Risk Indicators should:

a. Anticipate operational risks
b. Be based upon historical loss data
c. Be an objective measure of operational risk
d. Be monitored over time to detect trends

36. Which of the following option strategies can give the buyer an unlimited profit?

a. An American digital option
b. A European lookback call option
c. A European butterfly spread
d. An up-and-out with rebate barrier option

37. An equity options trader is short a call option of a stock with strike at $104. The maturity of the option is within half an hour and the current price is $103.75. Which of the following Greeks poses the highest risk to his position?

a. Delta
b. Gamma
c. Rho
d. Theta

38. How does the credit exposure of a long OTC put option on XYZ stock change when the stock price decreases?

a. Increases
b. Decreases
c. Doesn't vary with underlying stock price
d. There is no credit exposure on long options

39. In many instances securitization can offer a company significant benefits. In assessing the risk of investing in the stock of a bank that regularly securitizes assets in a highly commoditized market versus one that does not securitize assets, which of the following statements is most accurate:

a. The effect of the accounting treatment given the securitization by the securitizer might cause misleading evaluations when comparing the financial statements of the two banks.
b. Most securitizers provide only minimal credit support for their securitization.
c. The commoditization of the underlying market reduces your risk of investment in the bank that securitizes the assets.
d. The selling of the securitized assets results in a high level of risk transference allowing you to increase your risk-adjusted position allocation to the bank that regularly securitizes assets.

40. In the Geometric Brown Motion process for a variable $S$,

I. S is normally distributed
II. $d\ ln(S)$ is normally distributed
III. $dS/S$ is normally distributed
IV. S is lognormally distributed

a. I only
b. II, III and IV
c. IV only
d. III and IV

**41.** Which of the following is **NOT** a limitation of KMV's Estimated Default Frequency (EDF) model?

a. It is difficult to price sovereign credit risk since asset values and volatility are not directly observable
b. EDFs are biased by periods of high or low defaults
c. Takes a simplified view of the capital structure of a firm
d. The model often fails to explain real world credit spreads

**42.** You are to evaluate pricing models for collateralized securities. Which of the following models is most dependent upon an accurate prediction of collateral prepayment sensitivities?

a. Credit card debt
b. Residential mortgage debt
c. Commercial real estate
d. Hospital receivables

**43.** Consider the following statements and identify which ones are true:

I. Severity assessment involves the determination of the probability of loss should a failure occur in a given operational risk category
II. External dependency risk is a widely recognized operational risk component
III. Forecasting changes in asset and liability duration is one way to manage strategic operational risk
IV. Corporate restructuring is one of the transitory conditions that are particularly risky for organizations

a. I, II and IV
b. II and IV
c. I, II, and III
d. I, III and IV

**44.** Economic capital calculations for credit risk assume a recovery rate (defined as 1-loss rate). Recovery rates are dependent on the business model of the underlying counterparty and its asset volatility in value and size. Under normal anticipated circumstances which of the following types of companies will have the highest recovery rate?

a. An internet merchant of designer clothes
b. A hedge fund
c. An asset intensive manufacturing company
d. A commodities trader

45. A portfolio consists of 17 uncorrelated bonds, each rated B. The 1-year marginal default probability of each bond is 5.93%. Assuming an even spread of default probability over the year for each of the bonds, what is the probability of exactly 2 bonds defaulting in the first month?

a. 0.0325%
b. 0.325%
c. 0.024%
d. 0.24%

46. You are asked to bid to insure a one-year loan against credit losses in an amount that best reflects the economic value of the insurance you provide. You bid:

a. Your best estimate of the value of a put on the borrower with exercise price equal to the loan principal amount plus interest
b. The VaR of the loan given by the CreditMetrics VaR model used by your firm
c. The actuarial estimate of the credit loss
d. A VaR estimate obtained from the KMV model

47. The statistical measurement of the operational VaR is generated through the aggregation of the following general variables:

a. Insurance and severity
b. Brownian motion and frequency
c. Poisson and severity
d. Severity and frequency

48. Which of the options below does **NOT** describe a problem faced by banks when purchasing insurance as a hedge against operational risk?

a. The loss reimbursement period can take several years
b. The credit rating of insurers
c. The different perspective of operational risk between banks and insurers
d. Not having an operational VAR

**49.** Which of the following portfolios would have suffered the greatest drop in value as a result of the Russian debt crisis in 1998?

a. Long-short market neutral US equity fund
b. Long 5-year on the run US treasury
c. A money market account plus a pay fixed USD swap
d. Duration-matched portfolio, long US low-grade corporate bonds, short US treasuries

**50.** Which of the following is a weakness of the top-down approach to measuring operational risk?

a. It fails to consider historical information
b. You cannot use earnings volatility as an indicator of risk potential in this approach
c. Information on specific sources of risk is not provided
d. It is based on the specific mapping of business units, and not the overall organization

**END OF 2006 FRM PRACTICE EXAM I**

GARP

# 2006 FRM Practice Exam I

## Answer Key

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | a. | b. | **c.** | d. | | 26. | **a.** | b. | c. | d. |
| 2. | a. | b. | **c.** | d. | | 27. | a. | **b.** | c. | d. |
| 3. | a. | b. | **c.** | d. | | 28. | a. | b. | **c.** | d. |
| 4. | a. | **b.** | c. | d. | | 29. | a. | b. | **c.** | d. |
| 5. | a. | **b.** | c. | d. | | 30. | a. | **b.** | c. | d. |
| 6. | a. | b. | c. | **d.** | | 31. | a. | b. | **c.** | d. |
| 7. | a. | b. | **c.** | d. | | 32. | a. | b. | c. | **d.** |
| 8. | a. | b. | **c.** | d. | | 33. | a. | b. | **c.** | d. |
| 9. | a. | b. | c. | **d.** | | 34. | **a.** | b. | c. | d. |
| 10. | a. | **b.** | c. | d. | | 35. | **a.** | b. | c. | d. |
| 11. | a. | b. | **c.** | d. | | 36. | a. | **b.** | c. | d. |
| 12. | a. | b. | **c.** | d. | | 37. | a. | **b.** | c. | d. |
| 13. | **a.** | b. | c. | d. | | 38. | **a.** | b. | c. | d. |
| 14. | a. | b. | c. | **d.** | | 39. | **a.** | b. | c. | d. |
| 15. | a. | b. | **c.** | d. | | 40. | a. | **b.** | c. | d. |
| 16. | a. | b. | **c.** | d. | | 41. | a. | **b.** | c. | d. |
| 17. | a. | b. | **c.** | d. | | 42. | a. | **b.** | c. | d. |
| 18. | a. | b. | **c.** | d. | | 43. | a. | **b.** | c. | d. |
| 19. | a. | **b.** | c. | d. | | 44. | a. | b. | **c.** | d. |
| 20. | a. | **b.** | c. | d. | | 45. | a. | **b.** | c. | d. |
| 21. | a. | **b.** | c. | d. | | 46. | **a.** | b. | c. | d. |
| 22. | a. | b. | c. | **d.** | | 47. | a. | b. | c. | **d.** |
| 23. | a. | b. | c. | **d.** | | 48. | a. | b. | c. | **d.** |
| 24. | a. | b. | c. | **d.** | | 49. | a. | b. | c. | **d.** |
| 25. | a. | b. | **c.** | d. | | 50. | a. | b. | **c.** | d. |

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GARP

# 2006 FRM Practice Exam I
## Answers & Explanations

1. A two-year zero-coupon bond issued by corporate XYZ is currently rated A. One year from now XYZ is expected to remain at A with 85% probability, upgraded to AA with 5% probability, and downgraded to BBB with 10% probability. The risk free rate is flat at 4%. The credit spreads are flat at 40, 80, and 150 basis points for AA, A, and BBB rated issuers, respectively. All rates are compounded annually. Estimate the expected value of the zero-coupon bond one year from now (for USD 100 face amount).

a. USD 92.59
b. USD 95.33
c. USD 95.37
d. USD 95.42

**ANSWER: C**

*The expected value of the zero coupon bond one year from now is given by*

$$\frac{0.05*100}{1+0.044}+\frac{0.85*100}{1+0.048}+\frac{0.1*100}{1+0.055}=95.37$$

*Reference: Fixed Income Securities, Tuckman, 2002.*

2. Given the following:

Current spot CHF/USD rate: 1.3680 (1.3680CHF = 1USD)
3-month USD interest rates: 1.05%
3-month Swiss interest rates: 0.35%
(Assume continuous compounding)

A currency trader notices that the 3-month forward price is USD 0.7350. In order to arbitrage, the trader should:

a. Borrow CHF, buy USD spot, go long Swiss franc forward
b. Borrow CHF, sell Swiss franc spot, go short Swiss franc forward
c. Borrow USD, buy Swiss francs spot, go short Swiss franc forward
d. Borrow USD, sell USD spot, go long Swiss franc forwards

**ANSWER: C**

*The spot is quoted in terms of Swiss Francs per USD. To convert this into USD per Swiss Franc, we get: 1/1.3680 = 0.7310. The theoretical futures price = 0.7310 * exp((0.0105 – 0.0035) * 0.25) = 0.7323. Therefore, the quoted futures price is too high. Thus, one should sell the overvalued CHF futures contract.*

*In order to arbitrage, one would do the following:*
*1) Borrow 0.7310 * exp((-0.0035)*0.25) = 0.7304USD for 3 months.*
*2) Buy spot exp((-0.0035)*0.25) = 0.9991CHF, invest at 0.35% for 3 months.*
*3) Short a futures contract on 1 CHF.*

*At maturity,*
*1) Pay back 0.7304 * exp((0.0105) * 0.25) = 0.7323USD.*
*2) Receive 0.9991 * exp((0.0035) * 0.25) = 1 CHF.*

*3) Delivers 1 CHF on the futures contract, receives 0.7350USD.*

*An arbitrage profit of USD0.7350 - USD0.7323 = USD0.0027 would be realized in 3 months' time.*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

**3.** Capital is used to protect the bank from which of the following risks:

a. Risks with an extreme catastrophic financial impact
b. High frequency low loss events
c. Low frequency risks with significant severe financial impact
d. High frequency uncorrelated events

**ANSWER: C**
*Management knows that in the course of ordinary business, certain operations will fail. There will be a normal amount of operational loss that a business is willing to absorb as a cost of doing business. These failures are explicitly budgeted for in the annual business plan and are covered by the price of goods and services. Capital, on the other hand, will be used to cover low frequency events with significant severe financial impact. Catastrophic losses are the most extreme but also the rarest types of losses. Banks will try to find insurance to hedge catastrophic losses because capital will not protect bank from these risk.*

*Reference: Risk Management, Crouhy, Gail, and Mark, 2001.*

**4.** Which of the following is **NOT** an assumption of the Black-Scholes options pricing model?

a. The price of the underlying moves in a continuous fashion
b. The interest rate changes randomly over time
c. The instantaneous variance of the return of the underlying is constant
d. Markets are perfect, i.e. short sales are allowed, there are no transaction costs or taxes, and markets operate continuously

**ANSWER: B**
*The B-S model assumes:*
- *The price of the underlying asset moves in a continuous fashion.*
- *Interest rates are known and constant.*
- *Variance of returns is constant.*
- *Perfect liquidity and transaction capabilities*

*Thus, 'B' is the correct answer.*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

**5.** Given the following 30 ordered simulated *percentage* returns of an asset, calculate the VaR and expected shortfall *(both expressed in terms of returns)* at a 90% confidence level.

-16, -14, -10, -7, -7, -5, -4, -4, -4, -3, -1, -1, 0, 0, 0, 1, 2, 2, 4, 6, 7, 8, 9, 11, 12, 12, 14, 18, 21, 23

a. VaR (90%) = 10, Expected shortfall = 14
b. VaR (90%) = 10, Expected shortfall = 15

c. VaR (90%) = 14, Expected shortfall = 15
d. VaR (90%) = 18, Expected shortfall = 22

ANSWER: B
*Ten percent of the observations will fall at or below the 3rd lowest observation of the 30 listed. Therefore, the VaR equals 10. The expected shortfall is the mean of the observations exceeding the VaR. Thus, the expected shortfall equals (16 + 14) / 2 = 15.*

*Reference: Risk Budgeting, Pearson, 2002.*

6. You have a portfolio with a large investment in the Carpathia EUR 6% 07 bond. This bond rarely trades. Indicative bid prices for small size trades are posted for the bond, but they are mostly from dealers wanting to express a willingness to make negotiated trades. However, the Carpathia USD 9 3/8% 11 bond is liquid. Its dollar return is uncorrelated with the EUR/USD rate. Which of the following statements is correct?

a. The one-day USD VaR computed using the dollar return of the Carpathia USD 9 3/8% 11 bond is an unbiased estimate of the risk of the Carpathia EUR 6% 07 in dollars
b. The one-day VaR for the Carpathia EUR 6% 07 bond using daily indicative bid prices for the bond is an upward-biased estimate of the risk of the bond because the bid-ask spread on an illiquid bond is large
c. It is more appropriate to estimate the VaR of the Carpathia EUR bond using a mix of bonds to account for errors in the bond prices than just using the EUR bond
d. Unless a EUR futures position and a long position in the Carpathia USD bond replicate the Carpathia EUR bond, the VaR for the EUR bond should be computed over a multiple day horizon to account for illiquidity

ANSWER: D
*The traditional VAR models are, by construction, static. Increasing the risk horizon from one day to multiple days does not make the model static. Additionally, traditional VAR models assume to use market data from liquid markets. Liquidity risk cannot be factored into a traditional VAR model. Thus, unless the EUR bond can be replicated by a liquid EUR futures position and a long position in the 9 3/8% 11 bond (both of which are liquid assets), dynamic VAR must be used.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh and Saunders, 2004*

7. A standard synthetic CDO (basket credit default swap) references a portfolio of ten (10) individual corporate names. Assume the following:

- The total reference notional (basket notional) is X, and the term is Y years
- The reference notional per individual reference credit name is X/10 (i.e. equal weight per name)
- The default correlations between the individual reference credit names are all equal to one (1.0)
- The single-name credit default swap (CDS) spread for each individual reference credit name is 100 basis points, for a term of Y years
- The assumed recovery rate on default for all individual reference credits is zero in all cases

- The synthetic CDO comprises two tranches, a 50% junior tranche priced at a spread J, and a 50% senior tranche priced at spread S

All else held constant, if the default correlations between the individual reference credit names are reduced from 1.0 to 0.7, what is the effect on the relationship between the junior tranche spread J and the senior tranche spread S?

a. The relationship remains the same
b. S increases relative to J
c. J increases relative to S
d. The effect cannot be determined given the data supplied

**ANSWER: C**
*If the default correlations are initially all 1.0, then the only possible outcomes are that all issuers default at once, or no issuers default. Given the zero recovery assumption, a default would then affect the junior and senior tranches equally. Therefore the spreads on the junior and senior tranches would be identical (50bps and 50bps, since the total spread across the entire basket must be equal to the 100bps spread of all individual reference credits).*

*If the correlation is reduced below 1.0 to 0.70, there are some outcomes where only some issuers default; these cases will impact the junior tranche more than the senior tranche. However, the overall average default rate remains the same. This means that at a correlation less than 1.0, the junior tranche bears more of the risk than the senior tranche. Therefore, the spread on the junior tranche will increase relative to that of the senior tranche, because the total spread across the entire basket must remain 100bps. The correct choice is C.*

*Reference: Credit Derivatives, Meissner, 2005.*

**8.** Testing the fitness of the operational loss severity and frequency distributions to the data is fundamental. Which of the following is **NOT** a goodness-of-fitness test for severity distributions?

a. Kolmogorov-Smirnov
b. Anderson-Darling
c. Macaulay
d. Cramer-Von Mises

**ANSWER: C**
*Macaulay duration (choice C) is a measure of interest rate sensitivity. It is not a goodness-of-fitness test for severity distributions.*

*References: Fixed Income Securities, Tuckman, 2002, and Modeling, Measuring and Hedging Operational Risk, Cruz, 2002.*

**9.** An important step in structuring a securitization is determining an adequate level of credit support or enhancement. Which of the following is **NOT** one of common credit enhancement forms for securitization transactions?

a. Subordinated tranches of securitization debt
b. Excess Spread account
c. Cash reserve account

d. Sinking fund account

**ANSWER: D**

*Credit enhancements in securitizations protect investors against taking a loss on their securities when losses occur in the underlying asset pool. Credit enhancements can be structured in different forms including subordinated tranches of securitization debt, excess spread (interest payments and other fees received on the assets in the pool less the interest payments made on the ABS plus the fee paid the service the assets along with other expenses), cash reserve account, and over-collateralization.*

*'D' is correct. A sinking fund is a pool of money regularly set aside by a company to redeem its bonds, debentures or preferred stock from time to time as specified in the indenture. A sinking fund is not used a credit enhancement.*

*Reference: Demystifying Securitization. Moody's, 2003.*

**10.** John is an internal auditor covering risk management for a global insurance group in Asia. The company offers and manages investment-linked products ("ILP") for retail clients. ILP is an insurance that allows policyholders to participate in the return of the underlying investment portfolio. Which of the following assessments made during John's audit is indicative of a serious problem?

a. Local subsidiary of the group offers 5% of the portfolio return to the ILP investment manager as an incentive. There is no regulation or group policy that restricts such arrangement.
b. The portfolio accounting and valuation are calculated accurately by the investment manager.
c. Investment manager provides regular investment report to policyholders and its management.
d. The investment manager employs third-party analytic software to assist its daily portfolio management.

**ANSWER: B**

*In developing the lines of authority and responsibility for the risk management and control process, a primary consideration of senior management is the separation of responsibility for the measurement, monitoring and control of risk from the execution of transactions that give rise to the risk. Senior management should ensure 1) that there is appropriate segregation of duties and 2) that personnel are not assigned conflicting responsibilities.*

*Choice 'B' violates this principal of "Segregation of Duties", despite that they are calculated accurately. The portfolio accounting and valuation should be calculated by the Accounting Department. The accounting department is an independent department and it does report to the Investment Manager.*

*Reference: Risk Management and Capital Adequacy, Gallati, 2003.*

**11.** Based on a 90% confidence level, how many exceptions in back testing a VaR would be expected over a 250-day trading year?

a. 10
b. 15

c. 25
d. 50

**ANSWER: C**
*The number of exceptions = (1 – confidence interval) * (number of days)*
*= (1 –0.90) * (250) = 25.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh and Saunders, 2004.*

**12.** The result of the linear regression is: Y = 0.10 - 0.50 X with a correlation coefficient R = (-0.90). The fraction of the variance of Y attributable to X is equal to:

a. (-0.90)
b. (+0.90)
c. (+0.81)
d. (-0.50)

**ANSWER: C**
*R-squared is the square of the correlation coefficient and measures the fraction of the variance of Y that is attributable to X.*

$$R^2 = (-0.90)^2 = 0.81$$

*Reference: Reference: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

**13.** Suppose the face value of a three-year option-free bond is USD 1,000 and the annual coupon is 10%. The current yield to maturity is 5%. What is the Modified Duration of this bond?

a. 2.62
b. 2.85
c. 3.00
d. 2.75

**ANSWER: A**
*Given the annual coupon is 10% and the current yield to maturity is 5%, the price of the bond is given by:*

*P = $100 * (1/1.05) + $100 * (1/1.05^2) + $1100 * (1/1.05^3) = $1136.16*

*and the duration is:*

*D = 1 * (100/1136.16) + 2 * (100/1136.16) + 3 * (1100/1136.16) = 2.75*

*The, modified duration is D/(1 + yield), or 2.75 / (1.05) = 2.62.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

**14.** A bronze producer will sell 1,000 mt (metric tons) of bronze in three months at the prevailing market price at that time. The standard deviation of the change in the price of bronze over a 3-month period is 2.6%. The company decided to use 3-month futures on copper to hedge the exposure. The copper futures contract is for 25 mt of copper. The standard deviation of the

futures price is 3.2%. The correlation between 3-month changes in the futures price and the price of bronze is 0.77. To hedge its price exposure, how many futures contracts should the company buy/sell?

a. Sell 38 futures
b. Buy 25 futures
c. Buy 63 futures
d. Sell 25 futures

**ANSWER:** D

*To hedge the exposure, the company should sell futures and not buy. Their profits will be adversely affected by declines in the price. The number of contracts to sell, N, equals (Beta x Size of the position)/Size of one futures contract.*

$$\beta = \frac{Cov(spot, futures)}{\text{var}(futures)}$$

$$Cov = \sigma_{spot} \times \sigma_{futures} \times correlation$$

$$Cov = (0.026) \times (0.032) \times 0.62 = 0.00641$$

$$\beta = \frac{0.00641}{0.032^2} = 0.62625$$

$$N = \frac{0.62625 \times 1{,}000}{25} = 25.025$$

*Reference: Options, Futures, and Other Derivatives by C. Hull, 2006.*

15. Which of the following statements regarding liquidity risk is CORRECT?

a. Asset liquidity risk arises when a financial institution cannot meet payment obligations
b. Flight to quality is usually reflected in a decrease in the yield spread between corporate and government issues
c. Yield spread between on-the-run and off-the-run securities mainly captures the liquidity premium, and not the market and credit risk premium
d. Funding liquidity risk can be managed by setting limits on certain markets or products and by means of diversification

**ANSWER:** C

*'A' is incorrect. Asset liquidity risk arises when transactions cannot be conducted at quoted market prices due to the size of the required trade relative to normal trading costs.*
*'B' is incorrect. Flight to quality occurs when there is a shift in demand away from low-grade securities towards high-grade securities. The low grade market then becomes illiquid with depressed prices. This is reflected in an increase in the yield spread between corporate and government issues.*
*'C' is correct. On-the-run securities are very similar in terms of market and credit risk to off-the-run securities, hence the yield spread mainly captures the liquidity premium, while the market and credit risk premiums must be immaterial.*
*'D' is incorrect. Asset liquidity risk can be managed by setting limits on certain markets or products and by means of diversification. Funding liquidity risk refers to the inability to meet payment obligations when the institution runs out of cash*

*and is unable to raise additional capital. Funding liquidity risk can be managed by proper planning of cash flow needs*

*Reference: Financial Institutions Management, Saunders and Cornett, 2005.*

**16.** Which of the following fixed-income securities most likely has negative effective duration?

a. A range accrual note
b. A floating rate note
c. An interest-only tranche of a CMO
d. A principal-only tranche of a CMO

**ANSWER: C**
*The correct answer is 'C', an interest-only tranche of a CMO transaction.*

*An I-O tranche has negative duration because a decline in interest rates causes the I-O price to fall. As rates fall and mortgages begin to prepay, the flows of an I-O tranche vanish. (Whenever some of the principal is paid-off there is less available from which to collect interest.) When rates are very high and prepayments are low, the I-O is like a security with a fixed set of cash flows. It has greater notional amount based on which interest will be calculated. The price of an interest-only tranche will most likely increase as interest rate increases, leading to a negative effective duration.*

*References: Fixed Income Securities, Tuckman, 2002, and Financial Institutions Management, Saunders and Cornett, 2005.*

**17.** An investor holds a portfolio of USD 100 million. This portfolio consists of A-rated bonds (USD 40 million) and BBB-rated bonds (USD 60 million). Assume that the one-year probabilities of default for A-rated and BBB-rated bonds are 3 and 5 percent, respectively, and that they are independent. If the recovery value for A-rated bonds in the event of default is 70 percent and the recovery value for BBB-rated bonds is 45 percent, what is the one-year expected credit loss from this portfolio?

a. USD 1,672,000
b. USD 1,842,000
c. USD 2,010,000
d. USD 2,218,000

**ANSWER: C**
*Expected Loss = Default rate * Loss given default*
*Expected Loss = Default rate * Loan Size * (1 - Recovery Rate)*
*Expected Loss from A Bonds = 0.03 * 40,000,000 * (1 - 0.70) = 360,000*
*Expected Loss from B Bonds = 0.05 * 60,000,000 * (1 - 0.45) = 1,650,000*
*Total Expected Loss = 360,000 + 1,650,000 = 2,010,000*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**18.** Which of the following statements is the most accurate about the relationship between a normal distribution and a Student's t-distribution that have the same mean and standard deviation?

a. They have the same skewness and the same kurtosis.
b. The Student's t-distribution has larger skewness and larger kurtosis.
c. The kurtosis of a Student's t -distribution converges to that of the normal distribution as the number of degrees of freedom increases.
d. The normal distribution is a good approximation for the Student's t-distribution when the number of degrees of freedom is small.

**ANSWER:** C
*The skewness of both distributions is zero and the kurtosis of the Student's t-distribution converges to that of the normal distribution as the number of degrees of freedom increases.*

*Reference: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

**19.** The VAR on a portfolio using a 1-day horizon is USD 100 million. The VAR using a 10-day horizon is:

a. USD 316 million if returns are not independently and identically distributed
b. USD 316 million if returns are independently and identically distributed
c. USD 100 million since VAR does not depend on any day horizon
d. USD 31.6 million irrespective of any other factors

**ANSWER:** B
*'B' is the correct answer.*
*If returns are independently and identically distributed, then the VAR over n days equals the (1-day VAR) * n^(0.5). If the 1-day VAR is 100 million and n =10, then the 10-day VAR = 100,000,000 * 10^(0.5) = 316,000,000.*

*Reference: Risk Management and Derivatives, Stulz, 2003.*

**20.** The zero coupon bond of an A-rated company maturing in five years is trading at a spread of 1% over the zero-coupon bond of a AAA-rated company maturing at the same time. The spread can be explained by:

I. Credit Risk
II. Liquidity Risk
III. Tax differential

a. I only
b. I and II only
c. I and III only
d. I, II, and III

**ANSWER:** B
*'I' is correct. Part of the spread between A-rated and AAA-rated bonds is related default risk.*
*'II" is correct. Part of the spread between A-rated and AAA-rated bonds is related to liquidity risk.*
*'III is incorrect. Zero corporate bonds receive the same tax treatment regardless of the credit rating.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

21. Which one of the following statements about the normal distribution is NOT accurate?

a. Kurtosis equals 3.
b. Skewness equals 1.
c. The entire distribution can be characterized by two moments, mean and variance.
d. The normal density function has the following expression:

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{1}{2\sigma^2}(x-\mu)^2\right]$$

**ANSWER: B**
*The skewness of the normal distribution is 0, not 1.*
*The kurtosis of the normal distribution is 3, the normal distribution can be completely described by its mean and variance, and the density function of the normal distribution is as shown.*

*Reference: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

22. With all other things being equal, a risk monitoring system that assumes constant volatility for equity returns will understate the implied volatility for which of the following positions by the largest amount:

a. Short position in an at-the-money call
b. Long position in an at-the-money call
c. Short position in a deep in-the-money call
d. Long position in a deep in-the-money call

**ANSWER: D**
*A plot of the implied volatility of an option as a function of its strike price demonstrates a pattern known as the volatility smile or volatility skew. The implied volatility decreases as the strike price increases. Thus, all else equal, a risk monitoring system which assumes constant volatility for equity returns will understate the implied volatility for a long position in a deep-in-the-money call.*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

23. A portfolio is composed of two securities and has the following characteristics

- Investment in security A = USD 1,500,000
- Investment in security B = USD 3,000,000
- Volatility of security A = 7%
- Volatility of security B = 3%
- Correlation between security A and B = 10%

What is the closest answer for the portfolio diversified VAR at 95% confident level?

a. USD 7,351
b. USD 212,920
c. USD 365,715

d. USD 234,630

**ANSWER:** D

*To calculate the VAR of the portfolio, we first must calculate the volatility of the portfolio, σ. The variance of the portfolio equals:*

$\sigma^2 = (1/3)^2 (7\%)^2 + (2/3)^2 (3\%)^2 + 2*(1/3)*(2/3)*10\%*7\%*3\%$

$= 0.001$

*Thus, σ = 0.0316*

*Assuming a 95% confidence interval, VAR = 1.65 * 0.0316 * 4,500,000 = 234,630*

*Reference: Risk Budgeting, Pearson, 2002.*

**24.** Bank A, which is AAA rated, trades a 10-year interest rate swap (semi-annual payments) with Bank B, which is rated A-. Because of Bank B's poor credit rating, Bank A is concerned about the 10-year exposure it is going to run because of the swap deal. Which of the following measures help mitigate Bank A's credit exposure to Bank B?

I. Negotiate a CSA with Bank B and efficiently manage the collateral management system
II. Execute the swap deal as a reset swap wherein the swap will be marked to market every six months
III. Execute the swap deal with a break clause in the fifth year
IV. Decrease the frequency of coupon payments from semi-annual to annual

a. I only
b. IV only
c. I, II, III and IV
d. I, II and III

**ANSWER:** D

*'I' is correct. Negotiating a CSA and getting collateral from the counterparty is an effective way of mitigating credit exposure.*
*'II is correct. In a reset swap since the swap is marked to market every period, the credit exposure we run is only for that period i.e. till the next reset; this implies lesser exposure.*
*'III' is correct. A break clause is always useful since it gives the counterparties an opportunity to assess whether they want to continue for the rest of the term of the swap.*
*'IV' is incorrect. Decreasing the frequency of payments increases the credit exposure rather than decreasing it. This is because, more the time for the next payment, greater are the chances for the market rates to move in one counterparty's favor, thereby increasing its credit exposure to the other counterparty.*

*Reference: Credit Derivatives, Meissner, 2005.*

**25.** Which of the following credit risk models in Basel II attempts to recognize diversification effects through a granularity adjustment?

a. Standardized approach based on external credit ratings provided by external credit assessment institutions

b. Standardized approach based on internal portfolio credit risk model
c. Internal Rating Based approach using internal estimate of creditworthiness, subject to regulatory standards
d. All of the above

**ANSWER: C**

*The Standardized approach does not recognize diversification effects. Capital requirements under Internal Rating Based (IRB) approach are modified to reflect the overall diversification or "granularity" in a bank's loan portfolio. The granularity adjustments construct a specific regulatory measure of diversification of a bank's portfolio. This measure is then used to increase or decrease the baseline IRD regulatory capital requirements. If the regulatory diversification measure indicates that a portfolio is well (poorly) diversified, the granularity adjustment decreases (increases) regulatory capital from the IRB baseline. Under IRB banks estimate default probabilities of counterparties using their own methods subject to regulatory standards, which are then used with modified standardized inputs that come from the standardized approach.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**26.** Which of the following loans has the lowest credit risk?

| Loan | 1 Year Probability of Default | Loss Give Default | Remaining Term in Months |
|---|---|---|---|
| a. | 1.99% | 60% | 3 |
| b. | 0.90% | 70% | 9 |
| c. | 1.00% | 75% | 6 |
| d. | 0.75% | 50% | 12 |

**ANSWER: A**

*The 1 year probability of default needs to be adjusted to the remaining term using the formula* $[(1\text{-d\_month})^{12} = (1\text{-d\_annual})]$. *We multiply the monthly PD with the loss given default (LGD) to get the expected percentage loss (EL%):*

| *Loan* | *1 Year PD* | *LGD* | *Remaining Term* | *PD to Maturity* | *EL %* |
|---|---|---|---|---|---|
| *A* | *1.99%* | *60%* | *3* | *0.50%* | *0.301%* |
| *B* | *0.90%* | *70%* | *9* | *0.68%* | *0.473%* |
| *C* | *1.00%* | *75%* | *6* | *0.50%* | *0.376%* |
| *D* | *0.75%* | *50%* | *12* | *0.75%* | *0.375%* |

*As shown, loan A has the lowest EL%.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**27.** A portfolio management firm manages the fixed-rate corporate bond portfolio owned by a defined-benefit pension fund. The duration of the bond portfolio is 5 years; the duration of the pension fund's liabilities is 7 years. Assume that the fund sponsor strongly believes that rates will decline over the next six months and is concerned about the duration mismatch between portfolio assets and pension liabilities. Which of the following strategies would be the best way to eliminate the duration mismatch?

a. Enter into a swap transaction in which the firm pays fixed and receives floating.
b. Enter into a swap transaction in which the firm receives fixed and pays floating.
c. Purchase an interest rate cap expiring in six months.
d. Sell Eurodollar futures contracts.

ANSWER: B

*'A' is incorrect. Entering into a pay fixed swap will further reduce the duration of the assets. This will exacerbate the interest rate risk arising from the duration mismatch.*
*'B' is correct. Because the duration of the pension liabilities exceeds the duration of the bond portfolio (assets), the pension plan is at risk if interest rates fall. Specifically, in a falling rate environment, the value of the liabilities will increase by more than will the value of the assets, thereby eroding the pension surplus. The duration of a swap equals the difference between the duration of the fixed leg and the duration of the floating leg. By entering into a receive-fixed swap, the pension plan can increase the portfolio duration to equal that of the pension liabilities and consequently reduce interest rate risk.*
*'C' is incorrect. The duration of the option is only six months and would therefore not offset the duration mismatch.*
*'D' is incorrect. Selling futures will reduce the portfolio duration and augment the duration mismatch.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

**28.** According to the Basel Committee which of the options below is **NOT** a qualitative standard that a bank must meet before it is permitted to use the Advanced Measurement Approach (AMA) for operational risk capital:

a. Internal and/or external regulators must perform regular reviews of the operational risk management processes and measurement systems. This review must include both the activities of the business units and of the independent operational risk function
b. There must be regular reporting of operational risk exposures and loss experiences to business unit management, senior management and to the board of directors
c. The bank's internal operational risk measurement system should not be integrated into the day-to-day risk management processes of the bank but should provide a general overview of the operational risks involved in the processes and operations
d. The bank must have an independent operational risk management function that is responsible for the design and implementation of the bank's operational risk framework.

ANSWER: C

*'C' is not a qualitative standard. According to the Basel Committee, a "bank's internal operational risk measurement system must be closely integrated into the day-to-day risk management processes of the bank. Its output must be an integral part of the process of monitoring and controlling the bank's operational risk profile."*

*Reference: Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework, Bank for International Settlements, 2005.*

**29.** If a random variable $X$ has density $f(x)$ and random variable $Y$ has density $g(y)$, then $X$ and $Y$ are independent of each other if and only if their joint density function $h(x,y)$ satisfies,

a. $h(x,y) = k\, f(x)\, g(y)$ ; $k \neq 1$
b. $h(x,y) > f(x)\, g(y)$
c. $h(x,y) = f(x)\, g(y)$
d. $h(x,y) < f(x)\, g(y)$

**ANSWER:** C
*'C' is the definition of independence between two random variables. Two random variables X and Y are independent if and only if their joint density function is the product of the two marginal densities.*

*Reference: Schaum's Outline of Theory and Problems of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

**30.** According to the Basel Committee which of the options below is **NOT** a quantitative standard that a bank must meet before it is permitted to use the Advanced Measurement Approach (AMA) for operational risk capital:

a. A bank's risk measurement system should be sufficiently 'granular' to capture the major drivers of operational risk affecting the shape of the tail of the loss estimates
b. Supervisors will require the bank to calculate its regulatory capital as the Unexpected Loss (UL), disregarding the Expected Losses (EL)
c. Internally generated operational risk measures used for regulatory capital purposes must be based on a minimum 5-year observation period of loss data. When the bank first moves to the AMA a 3-year historical data window is acceptable.
d. The tracking of internal loss data

**ANSWER:** B
*'B' is not a quantitative standard. According to the Basel Committee, "Supervisors will require the bank to calculate its regulatory capital requirement as the sum of expected loss (EL) and unexpected loss (UL), unless the bank can demonstrate that it is adequately capturing EL in its internal business practices."*

*Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework, Bank for International Settlements, 2005.*

**31.** At the end of 2002, the annual marginal default rate was 2.3% for BBB-rated bonds. What is the survival rate for such bonds?

a. 2.3%
b. 7.7%
c. 97.7%
d. Insufficient information provided for the estimation

**ANSWER:** C
*The survival rate = 1 – Marginal Mortality Rate. Thus, the survival rate = 1 – 0.023 = 97.7%*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**32.** A portfolio manager has a $50 million investment in a high-tech stock with a volatility of 50% and a CAPM beta of 1. The volatility of 50% and the CAPM beta are estimated using daily returns over the past 252 days. A firm's capital allocation allocates capital based on a 1% VaR with a one-year horizon. The capital allocation is USD 66 2/3 million and exceeds the initial market value of the stock. Which of the following statements about the firm's capital allocation scheme is correct?

a. Since a stock has limited liability, the capital allocation cannot exceed $50 million. The firm's mistake is simply to ignore the expected return on the stock
b. The firm made no mistake. The stock is simply very risky
c. The firm makes the mistake of assuming the normal distribution for a high tech stock. The firm should adjust the volatility to take into account the possibility of jumps and 2.33 times the adjusted volatility would produce the right capital allocation
d. The firm should use the lognormal distribution for the stock price over a period of one year since the normal distribution for returns leads to a poor approximation of the distribution of the stock price a year hence

**ANSWER:** D

*For long horizons, one should use the log normal distribution for the stock price. For the period of year, the normal distribution for returns leads to a poor approximation of the distribution of the stock price one year out. The difference between the two distributions is driven by the size of the volatility over the horizon. Small values imply that the distributions are closely identical. However, if the volatility is large, the difference between the normal distribution and lognormal is large.*

*Reference: Risk Budgeting, Pearson, 2002.*

**33.** Find the operational VaR at a 95% confidence level given the following data.

| Frequency Distribution | |
|---|---|
| Probability | Number |
| 0.8 | 0 |
| 0.2 | 1 |

| Severity Distribution | |
|---|---|
| Probability | Loss |
| 0.75 | USD 20,000 |
| 0.24 | USD 100,000 |
| 0.01 | USD 600,000 |

a. USD 9,000
b. USD 45,000
c. USD 91,000
d. USD 100,000

**ANSWER:** C

*Steps to calculating operational VAR at a 95% significance level.*

*1. Calculate the expected loss. The expected loss = 0.2 * [ (0.75 * 20,000) + (0.24 * 100,000) + (0.01 * 600,000)] = 9,000.*
*2. Next calculate the loss at the 95%ile. Start with the largest loss and work backward. The probability of a $600,000 loss = 0.01*0.2 = 0.2%. The probability*

*of a $100,000 loss = 0.24*0.2 = 4.8%. Therefore, the cumulative probability is 5% and the 95%ile loss equals $100,000.*
*3. Finally, the operational VaR equals the 95%ile loss minus the expected loss = $100,000 – $9,000 = $91,000.*

*Reference: Risk Management, Crouhy, Galia, and Mark, 2001.*

**34.** Which of the following options is strongly path-dependent?

a. An Asian option
b. A binary option
c. An American option
d. A European call option

**ANSWER: A**
*'A' is correct. The payoff of an Asian option depends on the average price of the underlying asset.*
*'B', 'C' and 'D' are incorrect. Binary, American and European options are simple options whose payoff can be calculated using the price of the underlying asset at maturity only.*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

**35.** Which of the following arguments is **NOT** true? Key Risk Indicators should:

a. Anticipate operational risks
b. Be based upon historical loss data
c. Be an objective measure of operational risk
d. Be monitored over time to detect trends

**ANSWER: A**
*Key risk indicators seek to quantify all aspects that are sought by the risk manager to enable risk-based decision making. They serve as a gauge of potential downside outcomes. When applied risk key indicators are used to identify important business vulnerabilities. The operational risk profile using the risk indicators should be continually monitored, dynamic, and updated as often as new data (based on historical losses for example) are collected. Key risk indicators are based on historical loss data, are monitored over time to detect trends, and need to be an objective measure of operational risk. Key risk indicators do not anticipate operational risk.*

*Reference: Risk Management and Capital Adequacy, Gallati, 2003.*

**36.** Which of the following option strategies can give the buyer an unlimited profit?

a. An American digital option
b. A European lookback call option
c. A European butterfly spread
d. An up-and-out with rebate barrier option

**ANSWER: B**

*A is incorrect. An American digital option, even deep in-the-money, has pre-determined / limited payoff.*
*B is correct. A European lookback call option has unlimited upside.*
*C is incorrect. A butterfly spread can only give limited payoff.*
*D is incorrect. An up-and-out with rebate barrier option can only have limited upside (not knocked out) or pre-determined limited payoff (knocked out).*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

**37.** An equity options trader is short a call option of a stock with strike at $104. The maturity of the option is within half an hour and the current price is $103.75. Which of the following Greeks poses the highest risk to his position?

a. Delta
b. Gamma
c. Rho
d. Theta

**ANSWER:** B
*'A' is incorrect. Delta is the rate of change of the option price with respect to the price of the underlying. Delta is greatest for in-the money options.*
*'B' is correct. Gamma is the rate of change of the option's delta with respect to the price of the underlying security. The magnitude of gamma is greatest for short-term at-the-money options. Given the traders is short the option, the gamma poses the highest risk to his position.*
*'C' is incorrect. Rho is the rate of change of the option with respect to the interest rate. The longer the time to expiration, the more sensitive is the option value to changes in the interest rate.*
*'D' is incorrect. Theta measures the change in an option price with respect to the passage of time. Time decay is more severe for short-term options that are close to the money.*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

**38.** How does the credit exposure of a long OTC put option on XYZ stock change when the stock price decreases?

a. Increases
b. Decreases
c. Doesn't vary with underlying stock price
d. There is no credit exposure on long options

**ANSWER:** A
*Credit exposure from long positions in OTC options, assuming that the credit quality of the counterparty remains constant, is driven by the level of the contingent future liability, i.e. the larger the expected future claim against the counterparty, the larger the credit risk.*

*The value of the put at expiration is defined as max(X-S,0) where X=strike price and S=spot price. Therefore, a long put option increases in value as the stock price decreases. Thus, the expected liability of our counterparty is increased (choice A).*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**39.** In many instances securitization can offer a company significant benefits. In assessing the risk of investing in the stock of a bank that regularly securitizes assets in a highly commoditized market versus one that does not securitize assets, which of the following statements is most accurate:

a. The effect of the accounting treatment given the securitization by the securitizer might cause misleading evaluations when comparing the financial statements of the two banks.
b. Most securitizers provide only minimal credit support for their securitization.
c. The commoditization of the underlying market reduces your risk of investment in the bank that securitizes the assets.
d. The selling of the securitized assets results in a high level of risk transference allowing you to increase your risk-adjusted position allocation to the bank that regularly securitizes assets.

**ANSWER: A**

*'A' is the most accurate. The accounting treatment of a securitized asset can dramatically alter the look of an income statement and balance sheet.*
*'B' is not accurate. Most securitizers retain a material amount of risk either directly or indirectly through the support they give to the securitization.*
*'C' is not accurate. Commoditization of an asset only decreases the risks inherent in that particular investment, but would increase the risk of a bank's business model as the market becomes more securitized by reducing margins resulting in increased corporate risks.*
*'D' is not accurate. The size of the risk transfer depends on the amount of risk retained by the bank. As stated above, most securitizers retain a material amount of risk either directly or indirectly through the support they give to the securitization.*

*Reference: Demystifying Securitization for Unsecured Investors, Moody's Investors Service, 2003.*

**40.** In the Geometric Brown Motion process for a variable *S*,

I. S is normally distributed
II. *d ln(S)* is normally distributed
III. *dS/S* is normally distributed
IV. S is lognormally distributed

a. I only
b. II, III and IV
c. IV only
d. III and IV

**ANSWER: B**

*In the Geometric Brownian Motion (GBM) process for variable S:*

$$dS = \mu S\, dt + \sigma S\, dz$$

*From the above relation it follows that dS/S, which is equal to d ln(S), is normally distributed, whereas S is lognormally distributed.*

*References: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000 and Options, Futures, and Other Derivatives, Hull, 2006.*

41. Which of the following is **NOT** a limitation of KMV's Estimated Default Frequency (EDF) model?

a. It is difficult to price sovereign credit risk since asset values and volatility are not directly observable
b. EDFs are biased by periods of high or low defaults
c. Takes a simplified view of the capital structure of a firm
d. The model often fails to explain real world credit spreads

ANSWER: B
*Choices 'A', 'C' and 'D' are limitations of KMV's estimated default frequency model.*

*EDF are not biased by periods of high or low defaults as are models based on Moody's and Standard & Poor's risk ratings.*

*Reference: Risk Management, Crouhy, Galia, and Mark, 2001.*

42. You are to evaluate pricing models for collateralized securities. Which of the following models is most dependent upon an accurate prediction of collateral prepayment sensitivities?

a. Credit card debt
b. Residential mortgage debt
c. Commercial real estate
d. Hospital receivables

ANSWER: B
*Prepayment risk most often arises in the context of home mortgages when there is uncertainty as to whether a homeowner will repay and refinance the mortgage early. Prepayment risks are an important feature of mortgage backed securities, where the investor has granted the borrower the option to prepay the mortgage early.*

*Residential mortgages are subject to the greatest prepayment risk. This option is a complex option to value because it depends on the age of the loan, spread between mortgage rate and current interest rates, refinancing incentives, economic activities and seasonal factors. Therefore, pricing models for residential mortgage debt are very dependent on prepayment assumptions and models.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

43. Consider the following statements and identify which ones are true:

I. Severity assessment involves the determination of the probability of loss should a failure occur in a given operational risk category
II. External dependency risk is a widely recognized operational risk component
III. Forecasting changes in asset and liability duration is one way to manage strategic operational risk

IV. Corporate restructuring is one of the transitory conditions that are particularly risky for organizations

a. I, II and IV
b. II and IV
c. I, II, and III
d. I, III and IV

**ANSWER: B**
*'I' is incorrect. Severity assessment involves the determination of the extent of the loss, not the probability. Probability is measured by the net likelihood assessment.*
*'II' is a correct. The three components identified are operational failure risk, operational strategic risk and external dependency risk.*
*'III' is incorrect. Duration management is not part of strategic operational risk.*
*'IV' is correct. Corporate restructuring is one of the transitory conditions that are particularly risky for organizations.*

*Reference: Risk Management, Crouhy, Galai, and Mark, 2001.*

**44.** Economic capital calculations for credit risk assume a recovery rate (defined as 1-loss rate). Recovery rates are dependent on the business model of the underlying counterparty and its asset volatility in value and size. Under normal anticipated circumstances which of the following types of companies will have the highest recovery rate?

a. An internet merchant of designer clothes
b. A hedge fund
c. An asset intensive manufacturing company
d. A commodities trader

**ANSWER: C**
*The company with the highest recovery rate will be the company with the most tangible assets that can be valued in the event of default. Utilities, for example, have high recovery rates because they have large amounts of tangible assets, such as generating plants. Of the four choices – internet merchant, hedge fund, asset intensive manufacturing company and commodity trader – the asset intensive manufacturer would have the most tangible assets. Thus, choice 'C' is the correct choice.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**45.** A portfolio consists of 17 uncorrelated bonds, each rated B. The 1-year marginal default probability of each bond is 5.93%. Assuming an even spread of default probability over the year for each of the bonds, what is the probability of exactly 2 bonds defaulting in the first month?

a. 0.0325%
b. 0.325%
c. 0.024%
d. 0.24%

**ANSWER: B**

*Given a 1-year marginal default rate of 5.93%, the 1-month marginal default rate is $1 - (1 - 0.0593)^{(1/12)} = 0.00508$.*
*The number of combinations of 2 bonds from 17 bonds is 17*16/2, and so the probability of exactly 2 bonds defaulting in the first month is:*
*$(17*16/2) * (0.00508)^2 * (1 - 0.00508)^{15} = 0.325\%$*

*Reference: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

**46.** You are asked to bid to insure a one-year loan against credit losses in an amount that best reflects the economic value of the insurance you provide. You bid:

a. Your best estimate of the value of a put on the borrower with exercise price equal to the loan principal amount plus interest
b. The VaR of the loan given by the CreditMetrics VaR model used by your firm
c. The actuarial estimate of the credit loss
d. A VaR estimate obtained from the KMV model

ANSWER: A
*'A' is correct. Assuming the Merton model of debt, the expected loss for the one-year loan is the value of the put option on the borrower with an exercise price equal to the loan principal amount plus interest.*

*Reference: Risk Management and Derivatives, Stulz, 2003.*

**47.** The statistical measurement of the operational VaR is generated through the aggregation of the following general variables:

a. Insurance and severity
b. Brownian motion and frequency
c. Poisson and severity
d. Severity and frequency

ANSWER: D
*'A' is incorrect. Insurance is used to by entities to hedge catastrophic risk.*
*'B' is incorrect. Brownian motion is a distribution used to model stock prices.*
*'C' is incorrect. The Poisson distribution is one of the distributions used to measure the frequency of the loss.*
*'D' is correct. Operational risk is the risk of loss caused by failure in operational process or systems that support them. Operational risk events can be divided into high frequency/low severity events and low frequency/high severity events. Operational risk measurement models most incorporate both types of risk events.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh, and Saunders, 2004.*

**48.** Which of the options below does **NOT** describe a problem faced by banks when purchasing insurance as a hedge against operational risk?

a. The loss reimbursement period can take several years
b. The credit rating of insurers
c. The different perspective of operational risk between banks and insurers

d. Not having an operational VAR

**ANSWER: D**
*Choices 'A', 'B', and 'C' are problems that banks can face when purchasing insurance as a hedge against operational risk.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh, and Saunders, 2004.*

**49.** Which of the following portfolios would have suffered the greatest drop in value as a result of the Russian debt crisis in 1998?

a. Long-short market neutral US equity fund
b. Long 5-year on the run US treasury
c. A money market account plus a pay fixed USD swap
d. Duration-matched portfolio, long US low-grade corporate bonds, short US treasuries

**ANSWER: D**
*The Russian Crisis is an example of an environment in which there would be a flight to quality. A flight-to-quality is a flow of funds from riskier to safer investments in times of uncertainty. In this environment we would expect the demand for safer assets, and hence their prices, to increase. Thus, the price of US treasuries will increase. The demand of riskier assets, and hence their price would decline. We would see the prices of US corporates decline relative to US treasuries.*

*Of the four choices, choice D contains two asset classes which differ on the basis of risk. This duration matched portfolio would suffer the greatest drop if value because the price of US low-grade corporate would decline and the price of US treasuries would increase.*

*Reference: The Risk Management Process, Culp, 2001.*

**50.** Which of the following is a weakness of the top-down approach to measuring operational risk?

a. It fails to consider historical information
b. You cannot use earnings volatility as an indicator of risk potential in this approach
c. Information on specific sources of risk is not provided
d. It is based on the specific mapping of business units, and not the overall organization

**ANSWER: C**
*The top-down approach does not provide information on specific sources of risk. It levies an overall cost of operational risk to the entire firm.*
*'A' is incorrect. The top-down approach is based on historical information.*
*'B' is incorrect. Earnings volatility is suggested as an indicator of risk potential for this approach.*
*'C' is correct. Information on specific sources of risk in the organization is not provided.*
*'D' is incorrect. This is a strength of the bottom-up approach, not a weakness of the top-down approach.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh, and Saunders, 2004.*

GARP

# 2006 FRM Practice Exam II

## Candidate Answer Sheet

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 51. | (a.) | (b.) | (c.) | (d.) | 76. | (a.) | (b.) | (c.) | (d.) |
| 52. | (a.) | (b.) | (c.) | (d.) | 77. | (a.) | (b.) | (c.) | (d.) |
| 53. | (a.) | (b.) | (c.) | (d.) | 78. | (a.) | (b.) | (c.) | (d.) |
| 54. | (a.) | (b.) | (c.) | (d.) | 79. | (a.) | (b.) | (c.) | (d.) |
| 55. | (a.) | (b.) | (c.) | (d.) | 80. | (a.) | (b.) | (c.) | (d.) |
| 56. | (a.) | (b.) | (c.) | (d.) | 81. | (a.) | (b.) | (c.) | (d.) |
| 57. | (a.) | (b.) | (c.) | (d.) | 82. | (a.) | (b.) | (c.) | (d.) |
| 58. | (a.) | (b.) | (c.) | (d.) | 83. | (a.) | (b.) | (c.) | (d.) |
| 59. | (a.) | (b.) | (c.) | (d.) | 84. | (a.) | (b.) | (c.) | (d.) |
| 60. | (a.) | (b.) | (c.) | (d.) | 85. | (a.) | (b.) | (c.) | (d.) |
| 61. | (a.) | (b.) | (c.) | (d.) | 86. | (a.) | (b.) | (c.) | (d.) |
| 62. | (a.) | (b.) | (c.) | (d.) | 87. | (a.) | (b.) | (c.) | (d.) |
| 63. | (a.) | (b.) | (c.) | (d.) | 88. | (a.) | (b.) | (c.) | (d.) |
| 64. | (a.) | (b.) | (c.) | (d.) | 89. | (a.) | (b.) | (c.) | (d.) |
| 65. | (a.) | (b.) | (c.) | (d.) | 90. | (a.) | (b.) | (c.) | (d.) |
| 66. | (a.) | (b.) | (c.) | (d.) | 91. | (a.) | (b.) | (c.) | (d.) |
| 67. | (a.) | (b.) | (c.) | (d.) | 92. | (a.) | (b.) | (c.) | (d.) |
| 68. | (a.) | (b.) | (c.) | (d.) | 93. | (a.) | (b.) | (c.) | (d.) |
| 69. | (a.) | (b.) | (c.) | (d.) | 94. | (a.) | (b.) | (c.) | (d.) |
| 70. | (a.) | (b.) | (c.) | (d.) | 95. | (a.) | (b.) | (c.) | (d.) |
| 71. | (a.) | (b.) | (c.) | (d.) | 96. | (a.) | (b.) | (c.) | (d.) |
| 72. | (a.) | (b.) | (c.) | (d.) | 97. | (a.) | (b.) | (c.) | (d.) |
| 73. | (a.) | (b.) | (c.) | (d.) | 98. | (a.) | (b.) | (c.) | (d.) |
| 74. | (a.) | (b.) | (c.) | (d.) | 99. | (a.) | (b.) | (c.) | (d.) |
| 75. | (a.) | (b.) | (c.) | (d.) | 100. | (a.) | (b.) | (c.) | (d.) |

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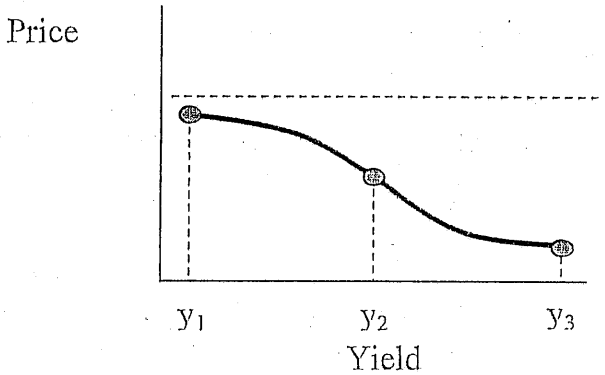
# 2006 FRM Practice Exam II
## Questions

51. As one of your duties as the chief risk officer for a fund of funds, you evaluate the risk management of candidate hedge funds. In your evaluation of a newly organized two person hedge fund, which of the following is your primary consideration?

a. Risk reporting structure
b. Investment style
c. Assets under management
d. Last month's return

52. What bond type does the following price-yield curve represent and at which yield level is convexity equal to zero?




a. Puttable bond with convexity close to zero at y2.
b. Puttable bond with convexity close to zero at y1 and y3.
c. Callable bond with convexity close to zero at y2.
d. Callable bond with convexity close to zero at y1 and y3.

53. "The obligor's capacity to meet its financial commitment on the obligation is still strong." What is the rating of this issue if this statement is given out by S&P?

a. AA
b. A
c. BBB
d. BB

54. The potential future credit exposure profile peaks at maturity for which of the following instruments:

I. FX forwards
II. Interest rate swaps
III. Cross currency swaps with final exchange

a. I only
b. II only
c. I and III
d. I, II and III

**Use the following is to answer questions 55 and 56**

Suppose that a business line of a bank has a loan book of USD 100 million. The average interest rate is 10%. The book is funded at a cost of USD 5.5 million. The economic capital against these loans is USD 7.5 million (7.5% of the loan value) and is invested in low risk securities earning 5.5% per annum. Operating costs are USD 1.5 million per annum and the expected loss on this portfolio is assumed to be 1% per annum (i.e., USD 1 million).

55. The risk-adjusted return of the business line used in the computation of RAROC is:

a. USD 2.4125 million
b. USD 3 million
c. USD 1.5875 million
d. USD 2 million

56. The RAROC for this business line is:

a. 26.7%
b. 37.1%
c. 21.2%
d. 32.2%

57. Which of the following internal controls does **NOT** effectively reduce operational risk?

a. Separation of trading from accounting and data entry
b. Automated reminders of payments required and contract expirations
c. A multitude of users can modify trade tickets so that errors may be quickly corrected
d. Reconciling results from different systems to ensure data integrity

58. A risk analyst performs a simple linear regression on return data comprising three variables evolving in time and obtains, amongst others, the following statistics:

| | Coefficients | Standard Error | *t*-statistic |
|---|---|---|---|
| Intercept | 49.94 | 2.85 | 17.53 |
| X Variable 1 | -38.79 | 138.93 | -0.28 |
| X Variable 2 | -431.75 | 170.50 | -2.53 |
| X Variable 3 | -70.40 | 121.06 | -0.58 |

Based on these data at a 95% confidence level, the analyst should conclude that:

a. The intercept and "X Variable 2" are statistically significant
b. "X Variable 1" and "X Variable 3" are statistically significant
c. "X Variable 1", "X Variable 2" and "X Variable 3" are all statistically not significant
d. More information is required, such as the corresponding *p*-values, before any meaningful deductions may be made.

59. Given the following ratings transition matrix, calculate the two-period cumulative probability of default for a 'B' credit.

| Rating at beginning of period | Rating at End of period | | | |
|---|---|---|---|---|
| | A | B | C | Default |
| A | 0.95 | 0.05 | 0.00 | 0.00 |
| B | 0.03 | 0.90 | 0.05 | 0.02 |
| C | 0.01 | 0.10 | 0.75 | 0.14 |
| Default | 0.00 | 0.00 | 0.00 | 1.00 |

a. 2.0%
b. 2.5%
c. 4.0%
d. 4.5%

60. As the CRO of a retail bank, you are presenting to your Risk Committee the benefits of securitizing a pool of mortgages. Which of the following would you use to support your arguments that this will benefit the bank?

I. It will improve your bank's return on capital
II. Will immediately increase your bank's available capital
III. You will be able to offer an attractive yield to investors
IV. It will lower your borrowing costs

a. I and III only
b. I, III, and IV only
c. I, II, III and IV
d. I, II, and IV only

**61.** What is the best estimate of the market value of a portfolio of USD 100 million invested in recently issued 6% 10-year bonds and USD 100 million of long 10-year zero coupon bond if interest rates decline by 0.50%:

a. USD 219 million
b. USD 195 million
c. USD 209 million
d. USD 206 million

**62.** Many financial applications are concerned only with extreme values of returns or exceptional losses for which we use extreme value distributions (EVD). The following is/are example(s) of EVDs:

I. Weibull distribution
II. Frechet distribution
III. Generalized Pareto distribution
IV. Student's t distribution

a. I and II
b. I, II and III
c. IV only
d. II and III

**63.** A situation where the existence of insurance changes the behavior of economic agents is referred to as:

a. Asymmetric information
b. Externalities
c. Moral hazard
d. Regulatory arbitrage

**64.** Which one of the following approaches to measure operational risk is **NOT** used only for a bottom-up approach?

a. Causal networks
b. Connectivity matrix
c. Multi-factor models
d. Reliability analysis

**65.** Which of the following outcomes is **NOT** associated with an operational risk process?

a. The sale of call options being booked as a purchase
b. A monthly volatility is inputted in a model that requires a daily volatility
c. A loss is incurred on an option portfolio because ex post volatility exceeded expected volatility
d. A volatility estimate is based on a time-series that includes a price that exceeds the other prices by a factor of 100

**66.** Which of the following **CORRECTLY** describe the similarities between Operational VAR and Market VAR?

I. Both VARs, when used for regulatory capital measurement, need to be validated against actual loss experience
II. Both are built on data (market prices for Market VAR and operational loss data for Operational VAR) that is readily available
III. Both are modeled based on a normal distribution
IV. Extreme Value Theory can be used to model extreme losses at the tail of the distribution for both Operational and Market VAR

a. I and IV
b. I, II and III
c. I, II and IV
d. II, III and IV

**67.** A European put option on a non-dividend paying stock has a remaining life of 6 months with a strike of USD 50 and the risk-free rate of 1%, after 3 months which of the following stock prices has the highest time-value of the option (in % of stock price)?

a. USD 10
b. USD 40
c. USD 50
d. USD 60

**68.** A portfolio of stock A and options on stock A is currently delta neutral, but has a positive gamma. Which of the following actions will make the portfolio both delta and gamma neutral?

a. Buy call options on stock A and sell stock A
b. Sell call options on stock A and sell stock A
c. Buy put options on stock A and buy stock A
d. Sell put options on stock A and sell stock A

**69.** Imagine a portfolio which holds two binary options, each with the same payoff and probability: USD -100 with a probability of 4% and USD 0 with a 96% probability. Assuming the underlying has uncorrelated returns, what is the VaR (95% confidence level, 1 day)?

a. The VaR is zero
b. The VaR is USD 100
c. The VaR is USD 200
d. None of the above

**70.** A firm has purchased a one-year European credit spread option with a USD 100 million notional for a 30 basis point premium. The security underlying the option contract is the 4% (semi-annual-pay) 5-year bond issued by IBM Corporation. The option is struck at 188 basis points. The 5-year Treasury yield is currently at 2.2%. Assume that Treasury yields remain constant over the horizon and that the required spread on IBM bonds widens from 180 basis points to 200 basis points. What is the net payout to the buyer of the credit spread option?

a. USD -437,000
b. USD 0
c. USD 137,000
d. USD 437,000

**71.** Vega measures the sensitivity of an option's price with respect to changes in the volatility of the underlying asset. Consider a graph where vega s on the Y axis, the underlying asset price is on the X axis, and the strike price is in the middle of the X axis. Which of the following best describes the graphical representation of vega for calls and puts?

a. Call: graph of vega resembles a U. Put: graph of vega resembles a U
b. Call: graph of vega resembles a U. Put: graph of vega resembles an inverted U
c. Call: graph of vega resembles an inverted U. Put: graph of vega resembles an inverted U
d. Call: graph of vega resembles an inverted U. Put: graph of vega resembles a U

72. Which of the following regarding option strategies is/are **NOT** correct?

I. A long strangle involves buying a call and a put with equal strike prices
II. A short bull spread involves selling a call at lower strike price and buying another call at higher strike price
III. Vertical spreads are formed by options with different maturities
IV. A long butterfly spread is formed by buying two options at two different strike prices and selling another two options at the same strike price

a. I only
b. I and III only
c. I and II only
d. III and IV only

73. Calculate the marginal mortality rate in year 3 for the following class of issuers.

| T | Value of bonds outstanding at the beginning of year T | Dollar value of bonds defaulted on during year T |
|---|---|---|
| 1 | USD 1,000 | 45 |
| 2 | | 55 |
| 3 | | 80 |

a. 3.45%
b. 6.38%
c. 6.40%
d. 8.89%

74. Consider an equity portfolio with market value of USD 100M and a beta of 1.5 with respect to the S&P 500 Index. The current S&P 500 index level is 1000 and each futures contract is for delivery of USD 250 times the index level. Which of the following strategy will reduce the beta of the equity portfolio to 0.8?

a. Long 600 S&P 500 futures contracts
b. Short 600 S&P 500 futures contracts
c. Long 280 S&P 500 futures contracts
d. Short 280 S&P 500 futures contracts

75. Which of the following is not considered a traditional mechanism used by banks in mitigating credit risk?

a. Netting
b. Credit quality migration
c. Embedded put options
d. Collateralization

**76.** Rank the following common credit risk mitigation options from greatest security to lowest security:

I. Parental guarantee
II. Letter of Credit
III. Securities as collateral (with a haircut parameter of 0%)
IV. Cash

a. I, IV, III, II
b. IV, III, II, I
c. IV, II, III, I
d. IV, II, I, III

**77.** Which of the following statements about sovereign debt is correct?

a. U.S. chapter 11 does not apply to sovereign debt issued under New York law.
b. In contrast to corporate defaults, it is not possible for creditors to seize assets of sovereigns.
c. Except for the recent default of Argentina, there is no history of sovereign defaults.
d. In contrast to corporates, the covenants of sovereign bonds cannot be changed by a unanimous vote of the bondholders.

**78.** Which of the following measures is the most suitable for performance measurement of a derivatives trading business unit?

a. Internal rate of return
b. Return on asset
c. Sharpe ratio
d. Risk adjusted return on capital

**79.** Which of these transactions will **NOT** result in a credit loss for Bank A in the event of default before maturity by Bank A's counterparty?

I. Bank A buys an ATM (at-the-money) call option on the USD/CHF and the CHF subsequently depreciates against the USD.
II. Bank A buys an interest rate cap and interest rates are below the cap level.
III. Bank A goes long AUD through an OTC forward contract on the AUD/YEN and the AUD subsequently appreciates against the YEN.
IV. Bank A receives fixed in an interest rate swap and interest rates have risen.

a. II & III.
b. II & IV.
c. I, II & III.
d. I, III & IV.

**80.** A company has a constant 7% per year probability of default. What is the probability the company will be in default after three years?

a. 7%
b. 19.6%
c. 21%
d. 22.5%

**81.** Your Board of Directors wants a comprehensive review of each business units' operational risk activities. As the head of the corporate operational risk unit, you know that little has been done to implement an operational risk process at the business unit level and that you need to immediately come up with a framework. Which of the following statements offers the best strategy?

I. The audit committee of the Board should first define its objectives to ensure that all the firm's business units' operational risk programs are providing required information
II. The auditing department is to be charged with developing an operational risk program for each business unit, with the business unit being made clearly aware that they will be held accountable for its implementation
III. That your department immediately assess the operational risk for each business unit using independent data feeds to ensure the information fed into the assessment cannot be manipulated
IV. A senior manager from each profit center is to be charged with developing their own operational risk self assessment program based on guidelines you provide.

a. I only
b. I and IV only
c. I and III only
d. IV only

**82.** Consider a risky zero-coupon bond maturing in one year. At that time the issuer owes USD 100 million. The issuer has no other debt and the bond can be priced using Merton's model. The bond is the only asset of a bank. Which of the following statements is correct?

a. The amount of risk capital required for this bond by the bank necessarily increases if the volatility of the assets of the issuer increases
b. The amount of risk capital required for this bond exhibits a hump shape - it first increases with asset volatility and then falls
c. The shape of the relation between the amount of risk capital and asset volatility cannot be determined without knowing the bank's RAROC hurdle rate
d. The shape of the relation between the amount of risk capital and asset volatility cannot be determined without knowing the confidence level at which the bank's credit-VaR is calculated

**83.** An interest rate collar can be structured by:

a. Buying an interest rate cap and selling an interest rate floor
b. Buying an interest rate cap and buying an interest rate floor
c. Selling an interest rate cap and selling an interest rate floor
d. Selling an interest rate cap and buying an interest rate floor

**84.** If Y = ln(X) and Y is normally distributed with zero mean and 2.33 standard deviation. What is the expected value of X?

a. 15.10
b. 3.21
c. 227.90
d. 1

**85.** Which of the following risk management strategies of a firm which has principal payments to make on its debt in one year that substantially exceed the market value of its assets is most likely to be in the interest of the shareholders?

a. Reduction of the overall risk level of the firm
b. Increase of the overall risk level of the firm
c. Keep the same risk level
d. It is impossible to say which risk management strategy the shareholders prefer

**86.** A sample has the following characteristics

- The mean of the sample is 2.5%
- Standard deviation is 1.5%
- 400 observations in the sample

Which is the standard error of the mean estimate?

a. 0.125%
b. 0.088%
c. 0.053%
d. 0.075%

87. Which of the following statements about operational risk is **NOT** true?

a. Operational risk is largely internal to a financial institution and thus observation data on operational losses are not easily available
b. Operational risk can be conceptually separated into exposures and risk factors, thus exposures are easily measured and controlled
c. Operational risk includes major failure of information technology systems and the inability to report in a timely manner to investors, regulators, and clients
d. Operational losses are unlikely to be uniform throughout all organizations and varies under different business profiles and internal control

88. Which of the following actions could worsen rather than reduce model risk?

a. Require documentation of the model so that the risk manager can produce the same prices as the user of the model
b. Use a simulation benchmark model to assess a model that has a closed-form solution
c. Make the model for the dynamics of the underlying fit past data better by making the price of the underlying depend on additional variables
d. Plot model prices against parameter values

89. Which of the following would always shorten a non-callable bond's duration?

a. Downgrade in credit rating
b. Upgrade in credit rating
c. Twist in the yield curve
d. A merger with another firm

90. If the current USD/AUD rate is 0.6650 (1 AUD=0.6650USD) and the risk-free rates for the USD and AUD are 1.0% and 4.5% respectively, what is the lower bound of a 5-month European put option on the AUD with a strike price of 0.6880?

a. 0.0135
b. 0.0245
c. 0.0325
d. 0.0455

**91.** Which of the following statements most accurately reflects characteristics of a reverse floater (with no options attached)?

a. A portfolio of reverse floaters carries a marginally higher duration risk than a portfolio of similar maturity normal floaters
b. A holder of a reverse floater can synthetically convert his position into a fixed rate bond by receiving floating and paying fixed on an interest rate swap
c. A reverse floater hedges against rising benchmark yields
d. A reverse floater's price changes by as much as that in a similar maturity fixed rate bond for a given change in yield

**92.** The KMV model measures the normalized "distance from default". How is this defined?

a. (Expected Assets - Weighted Debt) / (Volatility of assets)
b. Equity/ (Volatility of equity)
c. Probability of stock price falling below a threshold
d. Leverage x Stock Price Volatility

**93.** Two bond traders have USD 100 million invested each in just issued 10-year Microsoft Corp Bonds trading at par. 'A' has exposure in 6% 10-year callable bonds callable at the end of the 1st year at par while 'B' has invested in 5.95% 10-year vanilla bonds. Eleven months later, Microsoft is issuing new 10-year bonds at par paying a coupon of 5.50%. The market value of A's Microsoft bonds is:

a. Almost the same as that of B's Microsoft bonds
b. Much higher than that of B
c. Lower than that of B
d. Nothing can be said from the data given above

**94.** Which of the following IBM options has the highest gamma with the current market price of IBM common stock at USD 68?

a. Call option expiring in 10 days with strike USD 70
b. Call option expiring in 10 days with strike USD 50
c. Put option expiring in 10 days with strike USD 50
d. Put option expiring in 2 months with strike USD 70

95. With any other factors remaining unchanged, which of the following statements regarding bonds is **NOT** valid?

a. The price of a callable bond increases when interest rates increase
b. Issuance of a callable bond is equivalent to a short position in a straight bond plus a long call option on the bond price
c. The put feature in a puttable bond lowers its yield compared with the yield of an equivalent straight bond
d. The price of an inverse floater decreases as interest rates increase

96. Which of the following would **NOT** generally decrease credit risk?

a. Entering into an interest-rate swap with a counterparty
b. Signing a legally-binding netting agreement covering a portfolio of OTC derivative trades with a counterparty
c. Clearing an existing trade through a clearing house
d. Purchasing a credit derivative from a AAA-rated institution that pays USD 5 million if a bond defaults

97. The rate of change of duration with respect to the underlying yield of a fixed income bond is called:

a. Convexity
b. Delta
c. Theta
d. DVBP

98. The credit exposure of an interest rate swap differs from that of a bond in that:

I. The swap can be terminated by novation.
II. The principal amount of the swap is not at risk
III. Swaps benefit from higher recovery rates
IV. The full coupon amounts in the swap are not at risk

a. I and III
b. II and IV
c. II, III and IV
d. I, II, III and IV

**99.** Assume the annual volatility of the market is 20% and a stock's annual volatility is 30%. The $\beta$ of the stock is 1.2. What are the correlation and covariance, respectively, between the stock and the market?

| | CORRELATION | COVARIANCE |
|---|---|---|
| a. | 0.8 | 0.048 |
| b. | 0.048 | 0.8 |
| c. | 0.8 | Cannot be determined with the information given |
| d. | 0.048 | Cannot be determined with the information given |

**100.** What is the lowest tier of an investment grade credit rating by Moody's?

a. Baa1
b. Ba1
c. Baa3
d. Ba3

## END OF 2006 FRM PRACTICE EXAM II

GARP

# 2006 FRM Practice Exam II

## Answer Key

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 51. | a. | ● | c. | d. | 76. | a. | b. | ● | d. |
| 52. | a. | b. | ● | d. | 77. | ● | b. | c. | d. |
| 53. | a. | ● | c. | d. | 78. | a. | b. | c. | ● |
| 54. | a. | b. | ● | d. | 79. | a. | ● | c. | d. |
| 55. | ● | b. | c. | d. | 80. | a. | ● | c. | d. |
| 56. | a. | b. | c. | ● | 81. | a. | b. | c. | ● |
| 57. | a. | b. | ● | d. | 82. | a. | ● | c. | d. |
| 58. | ● | b. | c. | d. | 83. | ● | b. | c. | d. |
| 59. | a. | b. | c. | ● | 84. | ● | b. | c. | d. |
| 60. | a. | b. | ● | d. | 85. | a. | ● | c. | d. |
| 61. | a. | b. | ● | d. | 86. | a. | b. | c. | ● |
| 62. | a. | ● | c. | d. | 87. | a. | ● | c. | d. |
| 63. | a. | b. | ● | d. | 88. | a. | b. | ● | d. |
| 64. | a. | b. | ● | d. | 89. | ● | b. | c. | d. |
| 65. | a. | b. | ● | d. | 90. | a. | b. | ● | d. |
| 66. | ● | b. | c. | d. | 91. | a. | ● | c. | d. |
| 67. | a. | b. | ● | d. | 92. | ● | b. | c. | d. |
| 68. | a. | b. | c. | ● | 93. | a. | b. | ● | d. |
| 69. | a. | ● | c. | d. | 94. | ● | b. | c. | d. |
| 70. | a. | b. | ● | d. | 95. | ● | b. | c. | d. |
| 71. | a. | b. | ● | d. | 96. | ● | b. | c. | d. |
| 72. | a. | ● | c. | d. | 97. | ● | b. | c. | d. |
| 73. | a. | b. | c. | ● | 98. | a. | ● | c. | d. |
| 74. | a. | b. | c. | ● | 99. | ● | b. | c. | d. |
| 75. | a. | ● | c. | d. | 100. | a. | b. | ● | d. |

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GARP

# 2006 FRM Practice Exam II

## Answers & Explanations

51. As one of your duties as the chief risk officer for a fund of funds, you evaluate the risk management of candidate hedge funds. In your evaluation of a newly organized two person hedge fund, which of the following is your primary consideration?

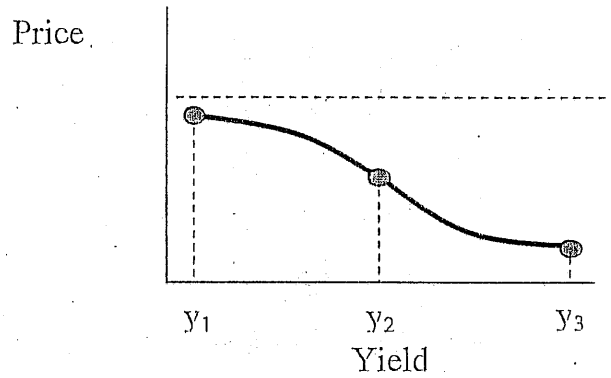
a. Risk reporting structure
b. Investment style
c. Assets under management
d. Last month's return

**ANSWER:** B

*Of the four choices, your primary consideration is the investment style of the two person hedge fund in your evaluation of the risk management of candidate hedge funds. The investment style will help you ascertain the type of assets in which the fund invests and the types of risks that the fund undertakes.*

*Reference: The New Generation of Risk Management of Hedge Funds and Private Equity Investments, Jaeger (editor), 2003.*

52. What bond type does the following price-yield curve represent and at which yield level is convexity equal to zero?




a. Puttable bond with convexity close to zero at y2.
b. Puttable bond with convexity close to zero at y1 and y3.
c. Callable bond with convexity close to zero at y2.
d. Callable bond with convexity close to zero at y1 and y3.

**ANSWER:** C

*Convexity measures how interest rate sensitivity (i.e., duration) changes with interest rates. Callable bonds exhibit negative convexity at certain yield combinations. Negative convexity means that as the market yield decreases duration decreases as well.*

*The correct answer is 'C'. The graph represents the price yield relation for callable bonds. Convexity is close to zero at y2.*

*Reference: Fixed Income Securities, Tools for Today's Markets, Tuckman, 2002.*

53. "The obligor's capacity to meet its financial commitment on the obligation is still strong." What is the rating of this issue if this statement is given out by S&P?

a. AA
b. A
c. BBB
d. BB

**ANSWER: B**
*'A' is incorrect. AA-rated: The obligor's capacity to meet its financial commitment is very strong.*
*'B' is correct. A-rated: The obligor's capacity to meet its financial commitment is still strong.*
*'C' is incorrect. BBB-rated: Adverse economic or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitment on the obligation.*
*'D' is incorrect. BB-rated: Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitment on the obligation.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

54. The potential future credit exposure profile peaks at maturity for which of the following instruments:

I. FX forwards
II. Interest rate swaps
III. Cross currency swaps with final exchange

a. I only
b. II only
c. I and III
d. I, II and III

**ANSWER: C**
*FX forwards and cross currency swaps with final exchange involve exchanging two currencies at rates fixed at inception. Because of this feature, the potential future credit exposure profile peaks at maturity for both these instruments. In case of interest rate swaps, there is no exchange of notional amounts. Therefore, the profile tends to peak well before maturity.*

*References: Risk Management and Derivatives, Stulz, 2003 and Options, Futures, and Other Derivatives, Hull, 2003.*

**Use the following is to answer questions 55 and 56**

Suppose that a business line of a bank has a loan book of USD 100 million. The average interest rate is 10%. The book is funded at a cost of USD 5.5 million. The economic capital against these

loans is USD 7.5 million (7.5% of the loan value) and is invested in low risk securities earning 5.5% per annum. Operating costs are USD 1.5 million per annum and the expected loss on this portfolio is assumed to be 1% per annum (i.e., USD 1 million). The firm's cost of capital is 15%.

**55.** The risk-adjusted return of the business line used in the computation of RAROC is:

a. USD 2.4125 million
b. USD 3 million
c. USD 1.5875 million
d. USD 2 million

**ANSWER:** A
*The risk-adjusted return used in the computation of RAROC is:*
*Expected revenue – expenses – expected losses = 100 * 0.01 + 7.5 * 0.055 – 5.5 – 1.5 – 1.0 = 2.4125*

*Reference: Risk Management, Crouhy, Galai, and Mark, 2001.*

**56.** The RAROC for this business line is:

a. 26.7%
b. 37.1%
c. 21.2%
d. 32.2%

**ANSWER:** D
*The RAROC for this business line is:*
*Risk-adjusted return / Risk-adjusted capital = 2.4125 / 7.5 = 32.2%*

*Reference: Risk Management, Crouhy, Galai, and Mark, 2001.*

**57.** Which of the following internal controls does **NOT** effectively reduce operational risk?

a. Separation of trading from accounting and data entry
b. Automated reminders of payments required and contract expirations
c. A multitude of users can modify trade tickets so that errors may be quickly corrected
d. Reconciling results from different systems to ensure data integrity

**ANSWER:** C
*Proper practice limits the amount of people who can change trade tickets and what information can be changed once a ticket is written. Double checking work, separating duties, and automatic reminders all help lower operational risk.*

*Reference: Risk Management and Capital Adequacy, Gallati, 2003.*

**58.** A risk analyst performs a simple linear regression on return data comprising three variables evolving in time and obtains, amongst others, the following statistics:

| | Coefficients | Standard Error | *t*-statistic |
|---|---|---|---|
| Intercept | 49.94 | 2.85 | 17.53 |
| X Variable 1 | -38.79 | 138.93 | -0.28 |
| X Variable 2 | -431.75 | 170.50 | -2.53 |
| X Variable 3 | -70.40 | 121.06 | -0.58 |

Based on these data at a 95% confidence level, the analyst should conclude that:

a. The intercept and "X Variable 2" are statistically significant
b. "X Variable 1" and "X Variable 3" are statistically significant
c. "X Variable 1", "X Variable 2" and "X Variable 3" are all statistically not significant
d. More information is required, such as the corresponding *p*-values, before any meaningful deductions may be made.

**ANSWER: A**

*A is correct. (Relatively) small standard errors and high t-stats are one indication of indicate statistical significance.*
*B is incorrect. – (Relatively) large standard errors and low t-stats are one indication of indicate statistical significance.*
*C is incorrect. Negative t-stats are not an indication of statistical insignificance.*
*D is incorrect. The p-values are redundant information if the t-stat is provided. That is, the p-values tell one nothing more than the t-stats do.*

*Reference: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

**59.** Given the following ratings transition matrix, calculate the two-period cumulative probability of default for a 'B' credit.

| Rating at beginning of period | Rating at End of period | | | |
|---|---|---|---|---|
| | A | B | C | Default |
| A | 0.95 | 0.05 | 0.00 | 0.00 |
| B | 0.03 | 0.90 | 0.05 | 0.02 |
| C | 0.01 | 0.10 | 0.75 | 0.14 |
| Default | 0.00 | 0.00 | 0.00 | 1.00 |

a. 2.0%
b. 2.5%
c. 4.0%
d. 4.5%

**ANSWER: D**

*The first period probability of default for a B-rated bond is 2%. In second period the probability of default is the probability of surviving year 1 and defaulting in year 2.*

*The year 2 probability of default = (0.03 * 0.00) + (0.90 * 0.02) + (0.05*0.14) = 2.5%.*

*Therefore, the two-period cumulative probability of default = 2% + 2.5% = 4.5%.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**60.** As the CRO of a retail bank, you are presenting to your Risk Committee the benefits of securitizing a pool of mortgages. Which of the following would you use to support your arguments that this will benefit the bank?

I. It will improve your bank's return on capital
II. Will immediately increase your bank's available capital
III. You will be able to offer an attractive yield to investors
IV. It will lower your borrowing costs

a. I and III only
b. I, III, and IV only
c. I, II, III and IV
d. I, II, and IV only

**ANSWER:** C

*Securitization is the process through which a variety of financial assets are packaged into securities that are then sold to investors. The cash flows generated by the underlying assets are used to pay the principal and interest on the securities in addition to the transaction expenses.*

*'I' is valid. Securitization can improve a bank's return on collateral by moving risk assets off the books.*
*'II' is valid. Moving assets off balance sheet can reduce capital requirements and improve capital adequacy.*
*'III' is valid. III, which is a benefit for the investor, could also in principle be relevant to the bank if the bank is having trouble placing securities (eg, severe adverse selection costs).*
*'IV' is valid. By moving riskier assets off the balance sheet via securitization, the bank can lower its borrowing costs.*

*Reference: Demystifying Securitization, Moody's, 2003.*

**61.** What is the best estimate of the market value of a portfolio of USD 100 million invested in recently issued 6% 10-year bonds and USD 100 million of long 10-year zero coupon bond if interest rates decline by 0.50%:

a. USD 219 million
b. USD 195 million
c. USD 209 million
d. USD 206 million

**ANSWER:** C

*To calculate the best estimate of the market value of the portfolio if interest rates decline 0.5%, one needs to calculate the change in the market value of each bond using duration. The duration of the 10-year zero coupon bond is 10. Thus, the change in value of this bond equals 10x0.005x100,000,000, which equals 5 million dollars.*

*The duration of the newly issued 6% bond is 7.802 assuming that the price of the bond is par. Given a duration of 7.802, the change in the value of the bond equals 7.802x0.005x100,000,000 which equals 3.91 million.*

*Thus, the best estimate of the market value of the portfolio if interest rates decline by 0.5% is 200 million + 5 million + 3.91 million which equals 208.91 million.*
*Thus, the correct answer is 'C'.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

**62.** Many financial applications are concerned only with extreme values of returns or exceptional losses for which we use extreme value distributions (EVD). The following is/are example(s) of EVDs:

I. Weilbull distribution
II. Frechet distribution
III. Generalized Pareto distribution
IV. Student's t distribution

a. I and II
b. I, II and III
c. IV only
d. II and III

**ANSWER:** B
*Weilbull and Frechet distributions are examples of Generalized Extreme Value distributions. Both distributions are used to model maximal loss. Generalized Pareto distribution is used to model excess over a threshold. However, Student's t distribution is not an example of EVD and cannot be used for modeling extreme values.*

*Reference: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

**63.** A situation where the existence of insurance changes the behavior of economic agents is referred to as:

a. Asymmetric information
b. Externalities
c. Moral hazard
d. Regulatory arbitrage

**ANSWER:** C
*The question is a definition of moral hazard:*

*'A' is incorrect. Asymmetric information describes the situation in which two parties have different amounts of information. For example, one party in a negotiation is not in the same position as another party, being ignorant of, or unable to observe, some information, which is essential to the contracting and decision making process.*
*'B' is incorrect. An externality occurs when the action of one party affects the payoffs of other parties.*
*'C' is correct. The presence of a safety net, such as insurance, encourages adverse or careless behavior. For example, once insurance is bought, the purchaser has less incentives to control his/her loss.*

*'D' is incorrect. Regulatory arbitrage attempts to defeat onerous capital requirements mandated by bank regulators.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh and Saunders, 2004 (pg. 186).*

64. Which one of the following approaches to measure operational risk is **NOT** used only for a bottom-up approach?

a. Causal networks
b. Connectivity matrix
c. Multi-factor models
d. Reliability analysis

**ANSWER: C**

*Bottom-up approaches analyze operational risk from the perspective of the business units that make up the entity's output. Causal networks, connectivity matrixes, and reliability analysis are part of the process approach used to estimate the operational risk of a business unit. Multi-factor models can be used in a top-down approach, particularly for publicly traded companies.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh and Saunders, 2004 (pg. 186).*

65. Which of the following outcomes is **NOT** associated with an operational risk process?

a. The sale of call options being booked as a purchase
b. A monthly volatility is inputted in a model that requires a daily volatility
c. A loss is incurred on an option portfolio because ex post volatility exceeded expected volatility
d. A volatility estimate is based on a time-series that includes a price that exceeds the other prices by a factor of 100

**ANSWER: C**

*Choices A, B, and D are outcomes that are associated with an operational risk process. Operational risk is the risk of loss caused by failure in operational process or systems that support them. Equivalently, operational risk is the breakdowns of people, processes, and systems within an organization. Given this definition, choices 'A', 'B', and 'D' are outcomes that are associated with an operational risk process.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh, and Saunders, 2004.*

66. Which of the following **CORRECTLY** describe the similarities between Operational VAR and Market VAR?

I. Both VARs, when used for regulatory capital measurement, need to be validated against actual loss experience
II. Both are built on data (market prices for Market VAR and operational loss data for Operational VAR) that is readily available
III. Both are modeled based on a normal distribution

IV. Extreme Value Theory can be used to model extreme losses at the tail of the distribution for both Operational and Market VAR

a. I and IV
b. I, II and III
c. I, II and IV
d. II, III and IV

**ANSWER: A**
*I and IV are correct comparisons.*
*'II' is not a correct comparison. While market risk data is readily available, operational losses (especially extreme operational losses) data are relatively sparse and pose significant difficulty for operational VAR modeling.*
*'III' is not a correct comparison. Other statistical distributions also are in use for modeling VAR. E.g. an Operational VAR can be derived from convolution of a frequency distribution (e.g. Poisson distribution) and a severity distribution (e.g. lognormal distribution).*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh, and Saunders, 2004.*

**67.** A European put option on a non-dividend paying stock has a remaining life of 6 months with a strike of USD 50 and the risk-free rate of 1%, after 3 months which of the following stock prices has the highest time-value of the option (in % of stock price)?

a. USD 10
b. USD 40
c. USD 50
d. USD 60

**ANSWER: C**
*A is incorrect. A deep in-the-money option has virtually no time value.*
*B is incorrect. An in-the-money option has smaller time value than an at-the-money option.*
*C is correct. The at-the-money option has the highest time value, given its highest gamma and theta.*
*D is incorrect. The out-of-the-money option has smaller time value than at-the-money option.*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

**68.** A portfolio of stock A and options on stock A is currently delta neutral, but has a positive gamma. Which of the following actions will make the portfolio both delta and gamma neutral?

a. Buy call options on stock A and sell stock A
b. Sell call options on stock A and sell stock A
c. Buy put options on stock A and buy stock A
d. Sell put options on stock A and sell stock A

**ANSWER: D**
*The correct answer is 'D', sell put options on stock A and sell stock A.*

*To reduce positive gamma, one needs to sell options. When call options are sold, the delta becomes negative and one needs to buy stock to keep delta neutrality. When put options are sold, the delta becomes positive, and one needs to sell stock to keep delta neutrality.*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

**69.** Imagine a portfolio which holds two binary options, each with the same payoff and probability: USD -100 with a probability of 4% and USD 0 with a 96% probability. Assuming the underlying has uncorrelated returns, what is the VaR (95% confidence level, 1 day)?

a. The VaR is zero
b. The VaR is USD 100
c. The VaR is USD 200
d. None of the above

**ANSWER:** B

*The VaR of each position is zero. Assuming a 95% confidence interval, the joint positions has a VAR equal to 100.*

| *Pay off of joint position* | *Probability* |
|---|---|
| *-200* | *$0.0016 = 0.042$* |
| *-100* | *$0.0768 = 2x0.96x0.4$* |
| *0* | *$0.9216 = 0.96^2$* |

*Reference: Risk Management and Derivatives, Stulz, 2003.*

**70.** A firm has purchased a one-year European credit spread option with a USD 100 million notional for a 30 basis point premium. The security underlying the option contract is the 4% (semi-annual-pay) 5-year bond issued by IBM Corporation. The option is struck at 188 basis points. The 5-year Treasury yield is currently at 2.2%. Assume that Treasury yields remain constant over the horizon and that the required spread on IBM bonds widens from 180 basis points to 200 basis points. What is the net payout to the buyer of the credit spread option?

a. USD -437,000
b. USD 0
c. USD 137,000
d. USD 437,000

**ANSWER:** C

*The value of the credit spread option is given by:Max{[($P_{SS} - P_{AS}$)/100]*notional,0} where $P_{SS}$ is the bond's price at the strike spread and $P_{AS}$ is the bond's price at the actual, prevailing spread in the market at option expiration.*

*The bond price at the strike spread of 188 basis points is $99.707 per $100 of face value. (Using a financial calculator, we use: N = 8 semi-annual periods, I = (2.2% + 188 basis points)/2 = 2.04, PMT = $2, FV = $100. Solving for PV, we get $99.707). Using a similar calculation methodology, the bond price at the actual spread of 200 basis points is $99.270 per $100 of face value (N = 8, I = (2.2% + 200 basis points)/2 = 2.1%, PMT = $2, FV = $100, resulting in PV = $99.270).*

*The value of the option is given by Max{[($P_{SS} - P_{AS}$)/100]*notional,0} = [$99.707 - $99.270)/100]*$100 million = $437,000.*
*The premium paid by the option buyer is ($100 million)*(30 basis points) = $ 300,000.*

*Therefore, the net payout to the option holder is $437,000 - $300,000 = $137,000. Thus, choice C is correct.*

*Reference: Credit Derivatives, Meissner, 2005.*

**71.** Vega measures the sensitivity of an option's price with respect to changes in the volatility of the underlying asset. Consider a graph where vega s on the Y axis, the underlying asset price is on the X axis, and the strike price is in the middle of the X axis. Which of the following best describes the graphical representation of vega for calls and puts?

a. Call: graph of vega resembles a U. Put: graph of vega resembles a U
b. Call: graph of vega resembles a U. Put: graph of vega resembles an inverted U
c. Call: graph of vega resembles an inverted U. Put: graph of vega resembles an inverted U
d. Call: graph of vega resembles an inverted U. Put: graph of vega resembles a U

**ANSWER: C**

*Vega measures the sensitivity of the option price to the underlying asset's volatility. The most sensitive area for the option is close to the money. When the option is out of the money or way in the money, it has little sensitivity to changes in underlying risk. This relation occurs because when the option is way out of the money it has to move a long way before it ever pays off. Similarly, when the option is way in the money, it has to move a long way before it is worthless. When the option underlying price is close to the strike price, whether the option will be worth something at expiration is uncertain. So, its sensitivity to changes in volatility increases. The graph for the call option and the put option will be the same. Given the discussion above, the graph of vega for the call and put will be an inverted U. The correct answer, therefore, is 'C'.*

*Reference: Options, Futures, and Other Derivatives, Hull, 2006.*

**72.** Which of the following regarding option strategies is/are **NOT** correct?

I. A long strangle involves buying a call and a put with equal strike prices
II. A short bull spread involves selling a call at lower strike price and buying another call at higher strike price
III. Vertical spreads are formed by options with different maturities
IV. A long butterfly spread is formed by buying two options at two different strike prices and selling another two options at the same strike price

a. I only
b. I and III only
c. I and II only
d. III and IV only

**ANSWER: B**

*'I' is incorrect. A long strangle involves buying a call and a put with different strike prices. Buying a call and a put with equal strike prices is a straddle.*
*'II' is correct. A long bull spread involves buying a call at lower strike price and selling a call at higher strike price. Hence, a short bull spread is the opposite, i.e. selling a call at lower strike price and buying a call at higher strike price*
*'III' is incorrect. Vertical spreads correspond to different strike prices, not maturities. Horizontal spreads correspond to different maturities.*

*'IV' is correct. A long butterfly spread is formed by buying two options at two different maturities and selling another two options at the same strike price.*

*Reference: Options, Futures and Other Derivatives, Hull, 2006.*

**73.** Calculate the marginal mortality rate in year 3 for the following class of issuers.

| T | Value of bonds outstanding at the beginning of year T | Dollar value of bonds defaulted on during year T |
|---|---|---|
| 1 | USD 1,000 | 45 |
| 2 | | 55 |
| 3 | | 80 |

a. 3.45%
b. 6.38%
c. 6.40%
d. 8.89%

**ANSWER: D**

*The marginal mortality rate is dollar value of debt defaulting in year T divided by total dollar value of bonds outstanding at the beginning of the year.*

| *T* | *Value of bonds outstanding at the beginning of year T* | *Dollar value of bonds defaulted on during year T* |
|---|---|---|
| *1* | *USD 1,000* | *45* |
| *2* | *USD 1,000 – 45 = 955* | *55* |
| *3* | *USD 955 – 55 = 900* | *80* |

*In the above table, the dollar value outstanding at the beginning of year 3 is 900. Therefore, the marginal mortality rate is 80/900 = 8.89%*

*Reference: Financial Institutions Management, Saunders and Cornett, 2005.*

**74.** Consider an equity portfolio with market value of USD 100M and a beta of 1.5 with respect to the S&P 500 Index. The current S&P 500 index level is 1000 and each futures contract is for delivery of USD 250 times the index level. Which of the following strategy will reduce the beta of the equity portfolio to 0.8?

a. Long 600 S&P 500 futures contracts
b. Short 600 S&P 500 futures contracts
c. Long 280 S&P 500 futures contracts
d. Short 280 S&P 500 futures contracts

**ANSWER: D**

*To reduce the beta of a portfolio, one needs to lower the position's exposure to the market. Thus, one needs to short futures contracts. The number of futures contracts, N, is:*

$$N = (\beta_{new} - \beta_{old}) \times \frac{\text{Size of spot position}}{\text{Size of one futures contract}}$$

$$= (0.8 - 1.5) \times \frac{100{,}000{,}000}{250 \times 1{,}000} = -280$$

*Thus, one needs to short 280 futures contracts.*

*Reference: Options, Futures and Other Derivatives, Hull, 2006.*

**75.** Which of the following is not considered a traditional mechanism used by banks in mitigating credit risk?

a. Netting
b. Credit quality migration
c. Embedded put options
d. Collateralization

**ANSWER: B**
*'A' is incorrect. Netting can reduce exposures to derivative counterparties*
*'B' is correct. Credit quality migration or transition matrices characterize the expected changes in credit quality of obligors.*
*'C' is incorrect. Embedded put options reduce downside price risk due to deteriorating credit quality. They provide investors with default protection in the sense that the investor holds the right to force early redemption at a pre-specified price.*
*'D' is incorrect. Collateralization provides ways for direct reductions in credit exposure.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**76.** Rank the following common credit risk mitigation options from greatest security to lowest security:

I. Parental guarantee
II. Letter of Credit
III. Securities as collateral (with a haircut parameter of 0%)
IV. Cash

a. I, IV, III, II
b. IV, III, II, I
c. IV, II, III, I
d. IV, II, I, III

**ANSWER: C**
*Cash, Letter-of-credit, Securities as collateral, and Parental guarantee.*
*A haircut parameter of 0% indicates a low-risk transaction and should be preferred over a parental guarantee. Parental guarantees can be difficult to enforce, a possibility of the parent company having financial distress as the subsidiary company and can take a substantial amount of time (and possibly court action) to collect.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**77.** Which of the following statements about sovereign debt is correct?

a. U.S. chapter 11 does not apply to sovereign debt issued under New York law.
b. In contrast to corporate defaults, it is not possible for creditors to seize assets of sovereigns.

c. Except for the recent default of Argentina, there is no history of sovereign defaults.
d. In contrast to corporates, the covenants of sovereign bonds cannot be changed by a unanimous vote of the bondholders.

**ANSWER:** A

*'A' is a correct. There are no international bankruptcy procedures for sovereign debt defaults.*
*'B' is incorrect. It is impossible for creditors to seize assets located inside the issuer country but creditor can seize assets held outside the issuer country.*
*'C' is incorrect. Argentina is not the only country to default on its debt. Mexico, for example, defaulted on its debt in August 1982.*
*'D' is incorrect. The covenants in most sovereign bonds can be changed with majority voting. Sovereign bonds can contain collective action clauses that contain majority restructuring provisions which enable a qualified majority to bind all bondholders of that issuer to a modification.*

*Reference: Financial Institutions Management, Saunders and Cornett, 2005, Chapter 16.*

**78.** Which of the following measures is the most suitable for performance measurement of a derivatives trading business unit?

a. Internal rate of return
b. Return on asset
c. Sharpe ratio
d. Risk adjusted return on capital

**ANSWER:** D

*'A' is incorrect. Internal rate of return is often used to measure the return on a capital budgeting decision. It is the interest rate that sets the NPV of the investment equal to zero.*
*'B' is incorrect. Return on asset is used to measure the performance of a firm. It can be used to measure the performance of a business unit but it does not adjust for risk. ROA is based on revenues and net income of the business unit.*
*'C' is incorrect. The Sharpe ratio measures the expected risk premium of a portfolio relative to its variability (i.e. (Expected return – risk free rate)/standard deviation).*
*'D' is correct. Risk adjusted return on capital measures the net economic profit of a unit divided by the capital allocated to the business unit. RAROC helps to determine whether the firm's' capital is sufficient to support all of it risk. It also helps to determine whether a business unit is producing a reasonable return relative to its risk profile.*

*Reference: Risk Management, Crouhy, Mark, Galai, 2001.*

**79.** Which of these transactions will **NOT** result in a credit loss for Bank A in the event of default before maturity by Bank A's counterparty?

I. Bank A buys an ATM (at-the-money) call option on the USD/CHF and the CHF subsequently depreciates against the USD.
II. Bank A buys an interest rate cap and interest rates are below the cap level.
III. Bank A goes long AUD through an OTC forward contract on the AUD/YEN and the AUD subsequently appreciates against the YEN.
IV. Bank A receives fixed in an interest rate swap and interest rates have risen.

a. II & III.
b. II & IV.
c. I, II & III.
d. I, III & IV.

**ANSWER: B**
*'I' is incorrect. It would result in a credit exposure as the option has moved in-the-money and has a positive value to Bank A.*
*'II' is correct. It would not result in any losses, as the option is out-of-the-money.*
*'III' is incorrect. It would result in a loss as the contract has a positive value to Bank A.*
*'IV' is correct. It would not result in any losses, as the replacement cost of finding a new fixed-rate payer is lower.*

*Reference: Credit Derivatives, Meissner, 2005.*

**80.** A company has a constant 7% per year probability of default. What is the probability the company will be in default after three years?

a. 7%
b. 19.6%
c. 21%
d. 22.5%

**ANSWER: B**
*The probability that the firm will be in default in three years = $1-(1-0.07)^3 = 19.6\%$*

*'A' is incorrect. 7% is the probability of default in one year.*
*'C' is incorrect. $21\% = 0.07x3$*
*'D' is incorrect. $22.5\% = 1.07^3 - 1$*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**81.** Your Board of Directors wants a comprehensive review of each business units' operational risk activities. As the head of the corporate operational risk unit, you know that little has been done to implement an operational risk process at the business unit level and that you need to immediately come up with a framework. Which of the following statements offers the best strategy?

I. The audit committee of the Board should first define its objectives to ensure that all the firm's business units' operational risk programs are providing required information
II. The auditing department is to be charged with developing an operational risk program for each business unit, with the business unit being made clearly aware that they will be held accountable for its implementation
III. That your department immediately assess the operational risk for each business unit using independent data feeds to ensure the information fed into the assessment cannot be manipulated
IV. A senior manager from each profit center is to be charged with developing their own operational risk self assessment program based on guidelines you provide.

a. I only

b. I and IV only
c. I and III only
d. IV only

ANSWER: D
*'I' is incorrect. 'I' is not the responsibility of the Audit Committee of the Board.*
*'II" is incorrect. The auditing department is not the best assessor of an individual business unit's risk, in fact many audit staff do not fully understand the risks of many of a firm's activities.*
*'III' is incorrect. 'III' is duplicative and should not come form the corporate department.*
*'IV' is correct. The best strategy for developing an operational risk framework is to empower business units with the responsibility, accountability and authority to manage their own operational risks. The business units know their risks the best.*

*Reference: Risk Management and Capital Adequacy, Gallati, 2003.*

**82.** Consider a risky zero-coupon bond maturing in one year. At that time the issuer owes USD 100 million. The issuer has no other debt and the bond can be priced using Merton's model. The bond is the only asset of a bank. Which of the following statements is correct?

a. The amount of risk capital required for this bond by the bank necessarily increases if the volatility of the assets of the issuer increases
b. The amount of risk capital required for this bond exhibits a hump shape - it first increases with asset volatility and then falls
c. The shape of the relation between the amount of risk capital and asset volatility cannot be determined without knowing the bank's RAROC hurdle rate
d. The shape of the relation between the amount of risk capital and asset volatility cannot be determined without knowing the confidence level at which the bank's credit-VaR is calculated

ANSWER: B
*A risky bond can be decomposed into a risk-free bond and a put option. The price of the bond equals the price of the default free bond minus the put option premium. As the asset volatility increases, the put premium will increase and the price of the risky bond will fall. Thus, a bond issued by a firm with extremely high asset volatility will be almost worthless, so that it requires little capital.*

*Reference: Risk Management and Derivatives, Stulz, 2003.*

**83.** An interest rate collar can be structured by:

a. Buying an interest rate cap and selling an interest rate floor
b. Buying an interest rate cap and buying an interest rate floor
c. Selling an interest rate cap and selling an interest rate floor
d. Selling an interest rate cap and buying an interest rate floor

ANSWER: A
*The structure of an interest rate collar involves buying an interest rate cap and financing the purchase by selling an interest rate floor. Thus, answer 'A' is correct.*

*Reference: Risk Management and Derivatives, Stulz, 2003.*

**84.** If Y = ln(X) and Y is normally distributed with zero mean and 2.33 standard deviation. What is the expected value of X?

a. 15.10
b. 3.21
c. 227.90
d. 1

**ANSWER:** A
*The expected value can be calculated by applying the following equation:*

$$E(X) = \exp\left(\mu + \frac{1}{2}\sigma^2\right) = \exp\left(0 + \frac{1}{2}2.33^2\right) = 15.10$$

*Reference: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

**85.** Which of the following risk management strategies of a firm which has principal payments to make on its debt in one year that substantially exceed the market value of its assets is most likely to be in the interest of the shareholders?

a. Reduction of the overall risk level of the firm
b. Increase of the overall risk level of the firm
c. Keep the same risk level
d. It is impossible to say which risk management strategy the shareholders prefer

**ANSWER:** B
*Once a firm is in distress, it is not in the interests of shareholders to reduce risk. If the firm stays in distress and eventually defaults, shareholders will end up with worthless shares. In these circumstances, management intent on maximizing shareholder value will seek out new risks.*

*Reference: Risk Management and Derivatives, Stulz, 2003.*

**86.** A sample has the following characteristics

- The mean of the sample is 2.5%
- Standard deviation is 1.5%
- 400 observations in the sample

Which is the standard error of the mean estimate?

a. 0.125%
b. 0.088%
c. 0.053%
d. 0.075%

**ANSWER:** D
*Standard Error of mean is defined as (Standard deviation)x(1/√n). Given the data in the question, the standard error of the mean = (0.015)x(1/√400) = 0.075%*

*Reference: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000.*

87. Which of the following statements about operational risk is **NOT** true?

a. Operational risk is largely internal to a financial institution and thus observation data on operational losses are not easily available
b. Operational risk can be conceptually separated into exposures and risk factors, thus exposures are easily measured and controlled
c. Operational risk includes major failure of information technology systems and the inability to report in a timely manner to investors, regulators, and clients
d. Operational losses are unlikely to be uniform throughout all organizations and varies under different business profiles and internal control

**ANSWER:** B
*Choices 'A', 'C', and 'D' are true statements.*
*'B' is not true. Unlike credit and market risk, the link between risk factors and the likelihood and size of operational losses is not so easy to establish. Here the line of causation runs through the internal controls.*

*Reference: Understanding Market, Credit, and Operational Risk, Allen, Boudoukh, and Saunders, 2004.*

88. Which of the following actions could worsen rather than reduce model risk?

a. Require documentation of the model so that the risk manager can produce the same prices as the user of the model
b. Use a simulation benchmark model to assess a model that has a closed-form solution
c. Make the model for the dynamics of the underlying fit past data better by making the price of the underlying depend on additional variables
d. Plot model prices against parameter values

**ANSWER:** C
*Choices 'A', B' and 'D' are procedures that help to monitor the model and can help to reduce model risk.*

*Reference: Measuring Market Risk, Dowd, 2005.*

89. Which of the following would always shorten a non-callable bond's duration?

a. Downgrade in credit rating
b. Upgrade in credit rating
c. Twist in the yield curve
d. A merger with another firm

**ANSWER:** A
*Lower credit rating leads to higher discount rate, decreasing weight at the long end.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

90. If the current USD/AUD rate is 0.6650 (1 AUD=0.6650USD) and the risk-free rates for the USD and AUD are 1.0% and 4.5% respectively, what is the lower bound of a 5-month European put option on the AUD with a strike price of 0.6880?

a. 0.0135
b. 0.0245
c. 0.0325
d. 0.0455

**ANSWER:** C

*The lower bound for a European option is given by the formula: $Xe^{-rT} - Se^{-r_f T}$, where X is the strike price, r is the risk-free rate of the USD, $r_f$ is the risk-free rate of the AUD, T is the time to maturity and S is the spot rate of the AUD/USD.*

*Thus, the lower bound = 0.6880 x [exp-(0.01x 5/12)] – 0.6650 x [exp-(0.045x 5/12]]*
*= 0.6880 x (0.9958) –0.6650 x (0.9814)*
*= 0.6851 – 0.6526 = 0.0325*

*Reference: Options Futures and Other Derivatives, Hull, 2006.*

**91.** Which of the following statements most accurately reflects characteristics of a reverse floater (with no options attached)?

a. A portfolio of reverse floaters carries a marginally higher duration risk than a portfolio of similar maturity normal floaters
b. A holder of a reverse floater can synthetically convert his position into a fixed rate bond by receiving floating and paying fixed on an interest rate swap
c. A reverse floater hedges against rising benchmark yields
d. A reverse floater's price changes by as much as that in a similar maturity fixed rate bond for a given change in yield

**ANSWER:** B

*A reverse floater (or an inverse floater) is a floater whose coupon fluctuates inversely with its reference rate—increasing when the reference rate decreases and decreasing when the reference rate increases. With each coupon payment, the floating rate is reset for the next period according to the formula: floating rate = fixed rate – (coupon leverage)x(reference rate). The multiplier is called the coupon leverage. Often, it is equal to 1, but not always. If it exceeds 1, the instrument is called a leveraged inverse floater.*
*'A' is not correct. Reverse floaters carry much higher duration risk than simple floaters that carry negligible duration risk.*
*'C' is not correct. A reverse floater hedges against falling and not rising benchmark yields.*
*'D' is not correct. The duration of a reverse floater is much more than that of a similar maturity fixed rate bond.*
*'B' is correct. The net impact of the reverse floater and the receive-floating, pay-fixed swap would be to cancel the floating leg (the investor pays floating in the floater but receives floating in the swap), leaving the investor with a fixed rate bond carrying a net coupon equal to the difference between the fixed rate in the reverse floater and fixed rate in the swap.*

*Reference: Credit Derivatives, Meissner, 2005.*

**92.** The KMV model measures the normalized "distance from default". How is this defined?

a. (Expected Assets - Weighted Debt) / (Volatility of assets)
b. Equity/ (Volatility of equity)

c. Probability of stock price falling below a threshold
d. Leverage x Stock Price Volatility

**ANSWER: A**
*The distance to default is defined as (Expected Assets – weighted debt) / (Volatility of assets), where weighted debt =short-term debt + ½ Long term debt. It is a normalized measure of default and therefore may be used for comparing one company to another. It is an ordinal measures akin to a bond rating. It does not tell you the probability of default. In order to extend this measure to a probability of default, KMV uses historical default rates to determine an expected default frequency as a function the distance to default.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*

**93.** Two bond traders have USD 100 million invested each in just issued 10-year Microsoft Corp Bonds trading at par. 'A' has exposure in 6% 10-year callable bonds callable at the end of the 1st year at par while 'B' has invested in 5.95% 10-year vanilla bonds. Eleven months later, Microsoft is issuing new 10-year bonds at par paying a coupon of 5.50%. The market value of A's Microsoft bonds is:

a. Almost the same as that of B's Microsoft bonds
b. Much higher than that of B
c. Lower than that of B
d. Nothing can be said from the data given above

**ANSWER: C**
*The market value of bonds in Portfolio 'A' will be very close to par value because they will be 'called' by Microsoft at par (since market yields are much lower now). On the other hand, Portfolio 'B' will appreciate sharply (nearly 50 basis points yield gain on a 9-year outstanding maturity bond). Hence, portfolio 'B' will have a much higher market value.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

**94.** Which of the following IBM options has the highest gamma with the current market price of IBM common stock at USD 68?

a. Call option expiring in 10 days with strike USD 70
b. Call option expiring in 10 days with strike USD 50
c. Put option expiring in 10 days with strike USD 50
d. Put option expiring in 2 months with strike USD 70

**ANSWER: A**
*Gamma is highest for at the money options nearing expiration. The at-the-money options are those with a strike of 70. The shortest dated options are the 10 day options. Thus, 'A' is correct.*

*References: Options, Futures, and Other Derivatives, Hull, 2006.*

**95.** With any other factors remaining unchanged, which of the following statements regarding bonds is **NOT** valid?

a. The price of a callable bond increases when interest rates increase
b. Issuance of a callable bond is equivalent to a short position in a straight bond plus a long call option on the bond price
c. The put feature in a puttable bond lowers its yield compared with the yield of an equivalent straight bond
d. The price of an inverse floater decreases as interest rates increase

**ANSWER: A**
*'A' is incorrect. The price of a callable bond will increase when the interest rate decreases, as the cost of issuing new debt is lower than the current coupon. Thus, the issuer will 'call' back the bond.*
*'B' is correct. The issuance of callable bond is equivalent to a short position in a straight bond plus a long call option on the bond price.*
*'C' is correct. The put feature will make the bond more attractive to investors, increasing its price and lowering its yield.*
*'D' is correct. As the interest rate increases, the coupon of inverse floater decreases. In addition, the discount factor increases. Hence, the value of the inverse floater note must decrease even more than a regular fixed-coupon bond.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

**96.** Which of the following would **NOT** generally decrease credit risk?

a. Entering into an interest-rate swap with a counterparty
b. Signing a legally-binding netting agreement covering a portfolio of OTC derivative trades with a counterparty
c. Clearing an existing trade through a clearing house
d. Purchasing a credit derivative from a AAA-rated institution that pays USD 5 million if a bond defaults

**ANSWER: A**
*'A' is correct. Entering into an interest rate swap causes the firm to be exposed to the credit risk of the swap counterparty.*
*'B' is incorrect. Netting agreements are one of the most powerful ways for controlling exposures. The purpose of these agreements is to provide for netting of payments across a set of contracts.*
*'C' is incorrect. Executing a trade through a clearing house will generally decrease credit risk. The counterparty to the contract is now the clearinghouse. Most clearinghouses are well capitalized and their risk of default is effectively zero.*
*'D' is incorrect. Credit derivatives are contracts that pass credit risk from one counterparty to another. A long position in the credit derivative will help to decrease credit risk as it pays USD 5 million if the bond defaults.*

*Reference: Credit Derivatives, Meissner, 2005.*

**97.** The rate of change of duration with respect to the underlying yield of a fixed income bond is called:

a. Convexity
b. Delta
c. Theta
d. DVBP

**ANSWER:** A

*Convexity measures how interest rate sensitivity changes with interest rates. Mathematically, convexity is defined as:*

$$C = \left(\frac{1}{P}\right)\left(\frac{d^2P}{dy^2}\right)$$

*where P is the price of the bond and y is the yield-to-maturity.*

*'B' is incorrect. Delta is the rate of change of the option price with respect to the price of the underlying.*
*'C' is incorrect. Theta measures the change in an option price with respect to the passage of time.*
*'D' is incorrect. DVBP refers to the dollar value of a basis point change.*

*Reference: Fixed Income Securities, Tuckman, 2002.*

**98.** The credit exposure of an interest rate swap differs from that of a bond in that:

I. The swap can be terminated by novation.
II. The principal amount of the swap is not at risk
III. Swaps benefit from higher recovery rates
IV. The full coupon amounts in the swap are not at risk

a. I and III
b. II and IV
c. II, III and IV
d. I, II, III and IV

**ANSWER:** B

*Bonds are balance sheet assets whose current and potential credit exposure is the amount that is loaned. The credit exposure of an interest rate swap (IRS) is a small fraction of the credit exposure due to a bond with the same principal. The principal amount of the swap is not at risk (notional amounts are not exchanged). The full value of the coupons is not at risk as only the net difference between the fixed and floating coupons is exchanged.*

*The swap can lead to a loss only if the default occurs when the contract is in the money and has positive value (a bond always has a positive value). Moreover, many of the regular counter-parties in the swaps market have netting agreements that reduce the credit exposure even further by setting off swaps that have positive value (for the non-defaulting party) with those that have negative values. Such arrangements are not available to bond holders.*

*Reference: Risk Management and Derivatives, Stulz, 2003.*

**99.** Assume the annual volatility of the market is 20% and a stock's annual volatility is 30%. The $\beta$ of the stock is 1.2. What are the correlation and covariance, respectively, between the stock and the market?

| | CORRELATION | COVARIANCE |
|---|---|---|
| a. | 0.8 | 0.048 |

| | | |
|---|---|---|
| b. | 0.048 | 0.8 |
| c. | 0.8 | Cannot be determined with the information given |
| d. | 0.048 | Cannot be determined with the information given |

**ANSWER:** A

*A is correct. The calculation is*

$$\beta = \frac{\text{cov}(R_s, R_M)}{\text{var}(R_M)} \rightarrow \text{cov}(R_s, R_M) = \beta \times \text{var}(R_M)$$

$$\text{corr} = \frac{\text{cov}(R_s, R_M)}{\sigma(R_s) \times \sigma(R_M)}$$

$$\beta = 1.2; \sigma(R_s) = 0.3; \text{ and } \sigma(R_M) = 0.2$$

$$\text{cov}(R_s, R_M) = 1.2 \times (0.2)^2 = 0.048$$

$$corr(R_s, R_M) = \frac{0.048}{0.3 \times 0.2} = 0.8$$

*B is incorrect – the values have been swapped (i.e. are in the wrong places).*
*C is incorrect – there is sufficient information for the covariance to be determined.*
*D is incorrect – the correlation calculation is incorrect and there is sufficient information for the covariance to be determined.*

*References: Schaum's Outline of Probability and Statistics, Spiegel, Schiller, and Srinivasan, 2000 and Risk Management and Derivatives, Stulz, 2003.*

**100.** What is the lowest tier of an investment grade credit rating by Moody's?

a. Baa1
b. Ba1
c. Baa3
d. Ba3

**ANSWER:** C

*Investment grade debt is debt rated BBB-rated or better by Standard's and Poor and Baa3 or better by Moody's.*

*Reference: Measuring and Managing Credit Risk, De Servigny and Renault, 2004.*